THE METAL INDUSTRY
WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD, THE BRASS FOUNDER AND FINISHER AND ELECTRO-PLATERS REVIEW
A TRADE JOURNAL RELATING TO THE NON-FERROUS METALS AND ALLOYS.

OLD SERIES VOL. 16, No. 7. NEW YORK, JULY, 1910. NEW SERIES VOL. 8, No. 7.

SOME POINTS IN CONNECTION WITH THE HISTORY AND EVOLUTION OF WIRE DRAWING.

A DESCRIPTION OF THE PRODUCTION OF WIRE IN ENGLAND.

BY DRAHTZIEHER.

It is not generally known that the art of wire drawing is one of the oldest, if not the oldest, of the practical arts. The consumption of wire for its innumerable applications, at the present day, has grown to enormous proportions, and its birth may be said to have dated from the time of Aaron, whose sacerdotal robes were ornamented with small pieces of wire. This points to the fact that wire was already recognized; in fact, both Homer and Pliny make mention of wires. These wires were not wire in the sense we speak of at the present day; they were simply small pieces of metal, probably gold or silver, hammered into thin strips, and as far as is known it served no useful purpose, being entirely used for decorating articles of wearing apparel. Between the years 1350 and 1360 wire drawers were known in Germany; from the mention of the term wire drawer, or drahtzieher, it may be conjectured that wire dies or draw plates were used, but it is quite probable that the term might be applied to those drawing down metal into wires under a hammer; it is a term which is recognized in many smiths' shops at the present day.

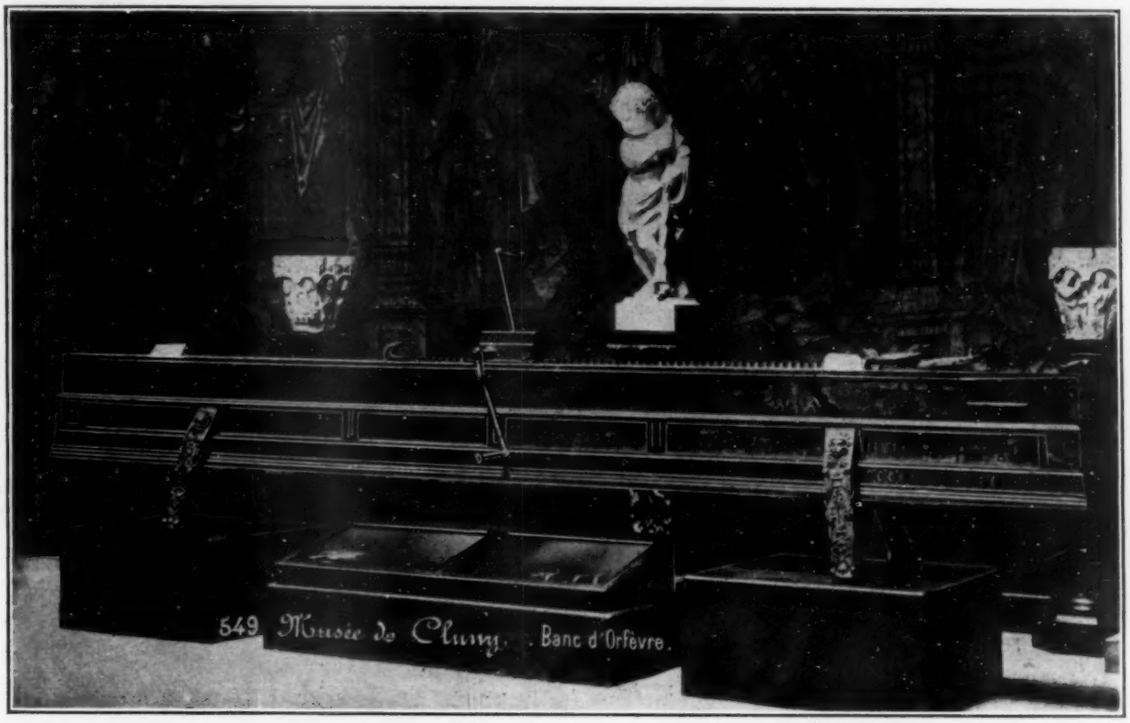


FIG. 1. DRAW BENCH ON EXHIBITION IN THE MUSEE DE CLUNY, NEAR PARIS.

EARLY BEGINNING OF THE INDUSTRY.

The real industry appears to have been started by Queen Elizabeth and Anne of Denmark, for producing toilet pins. That the process at that time was a lengthy one can be gathered from the apparent fact that the first-mentioned queen absorbed the whole output from a mill driven by a water wheel. From this time the industry took a firm hold in the country, and the production of wire for all classes of work is rapidly increasing, together with the uses to which it is put. It is estimated that between 150,000 to 200,000 tons of wire are annually produced in England. The number of miles this represents is prodigous; involves the labor of many thousands of people and embraces a considerable proportion of the yearly expenditure in

the industrial world. At the present time there is a very large amount of wire being delivered into this country from abroad, chiefly from Germany. This may be wholly accounted for by the fact that owing to the large quantity they produce they are able to deliver in this country at a lower figure than the English makers can produce at.

The larger the output that a plant can produce, the cheaper it can be made, and we find that foreign manufactories erect their plants to give the greatest possible output, and they work on this output producing at a cheap figure, and are consequently able to compete favorably against the British manufacturer who, if he should put a similar plant down, worked on the same lines, would find no market for the whole of his output. This difference is, of course, affected by the absence of tariff on goods imported into this country. These notes are not intended as a political harangue, but it is a point for notice, en passant, that wire drawers in this country would receive very considerable benefits by the introduction of a judicious tax on wire imported into this country.

THE USES OF WIRE.

The uses to which wire is put are increasing year by year, and although wire is generally thought of as

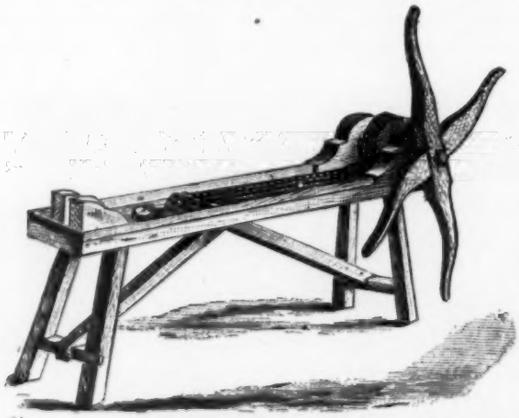


FIG. 2. OLD TYPE OF WOODEN DRAW BENCH.

a thin, round length of metal, yet its definition—a thread of metal—is a broader expression, for wire is drawn with a multiplicity of shapes, such as pinion wire, eight-shaped wire as used for transmission of electric current, turbine strip, square and hexagon wires, semi-circular and shaped wires of all descriptions. The writer has recently heard of a remarkable piece of wire, which was stated to have a continuous taper for a length of two miles. This would represent a very ingenious piece of work, and is one which very few wire drawers in any country would care to do, and this feat is happily placed to the credit of this country.

The uses to which wire is put are innumerable. Wire forms a part of the life of practically every human being, and is applied in some form to probably every known industry, from the manufacture of artificial hair, with wire measuring only .0001 inch in diameter to wire employed in the manufacture of heavy guns, rigging for ships, electrical transmission of energy, ropes for mines, etc. By far the greatest consumption is of steel wire, but wires of non-ferrous metals and alloys are increasing in consumption, chiefly owing to the growth of the electrical industry, which has its most vital interests in copper wire and drawn strip. An interesting shape produced in brass wire is pinion wire, from which is cut the pinion wheels used in watch and clock making. The accompanying illustration (Fig. 3) gives an idea of the various shapes that are produced.

It is perhaps unnecessary to state that wire is produced by being drawn through a die having a hole smaller in diameter, or sectional area, than its initial size, and with this fundamental principle in mind it is of interest to follow the evolution of wire-drawing machines.

SOME EARLY FORMS OF MACHINERY.

Probably the first type in use is described by Mr. J. Phillips Bedson, from which description the following sketch is built up. It appears that a waterwheel actuated a long wooden pole, giving it a reciprocatory motion backwards and forwards. In the forward stroke the wire was drawn through the die, and on its back-

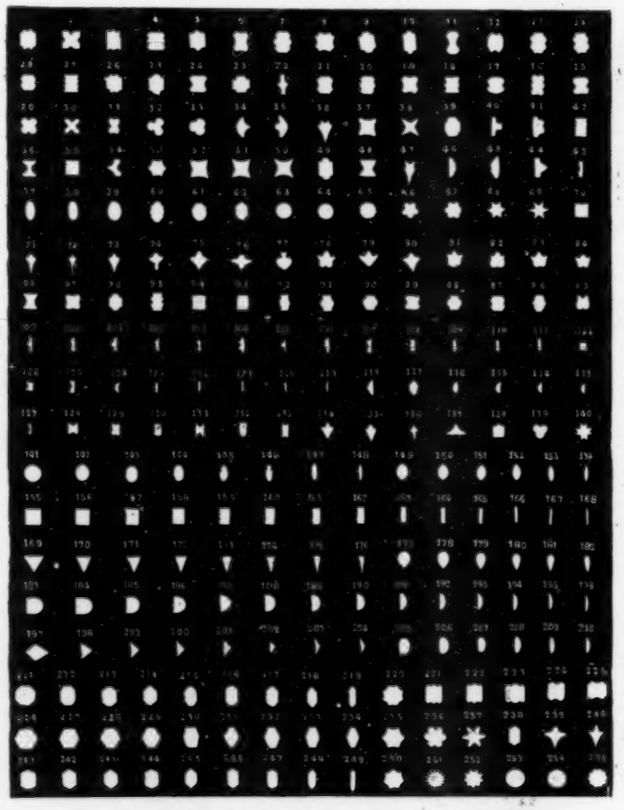


FIG. 3. SHOWING VARIOUS SHAPES OF DRAWN WIRE.

ward stroke the drawn length was coiled by the workman, who then had time to fix the pole for drawing a further length. There is only vague information to be had—the stroke and speed being unknown—but it can be imagined that the first was six or eight feet, while the latter was very slow.

Another old type of wooden draw bench is that showing in the following figure (Fig. 2). There are similar benches in use in some of the old jewelers' shops in this country, where only occasional and light work is done. The machine consists of a wooden wheel working a drum to which is attached a rope, at the end of which is a pair of tongs for gripping the wire. The die through which the wire is drawn is placed against the wooden uprights seen in the sketch. The following illustration (Fig. 1) shows an extremely elaborate draw bench which is on exhibition in the

Musée de Cluny, near Paris. It is made of iron throughout and beautifully engraved, carved and inlaid. The illustration clearly shows the method of working, which consists in turning the hand levers shown, which are connected to a toothed wheel which gears with rack, the wheel being fixed; the rack is moved along, pulling the wire through the die as shown. Each end of the table is provided with uprights for receiving dies, and the tongs or grips can be attached to either end of the rack. This machine is dated about 1564 and is probably of German design, being made for the use of Anne of Denmark.

These machines show the first ideas of wire drawers, and from these have been elaborated the drum type of machine. It is clear that one of the principal objections to this type of machine is that only a comparatively short length can be drawn at one stroke, which would necessitate a long length of wire being gripped at various points in its length, as well as the loss of time in taking the rack back when at the end of its stroke. It is extremely interesting to note that in the last-mentioned machine the builders evidently had this in mind, in allowing a die at each end of the rack, so that both the backward and forward stroke could be utilized. However, the aim of wire drawers, from the commencement of things, has been to increase the length of wire drawn at one operation, and the obvious improvement of fixing one end of the wire to a revolving drum was next introduced, and this method remains in use to the present day.

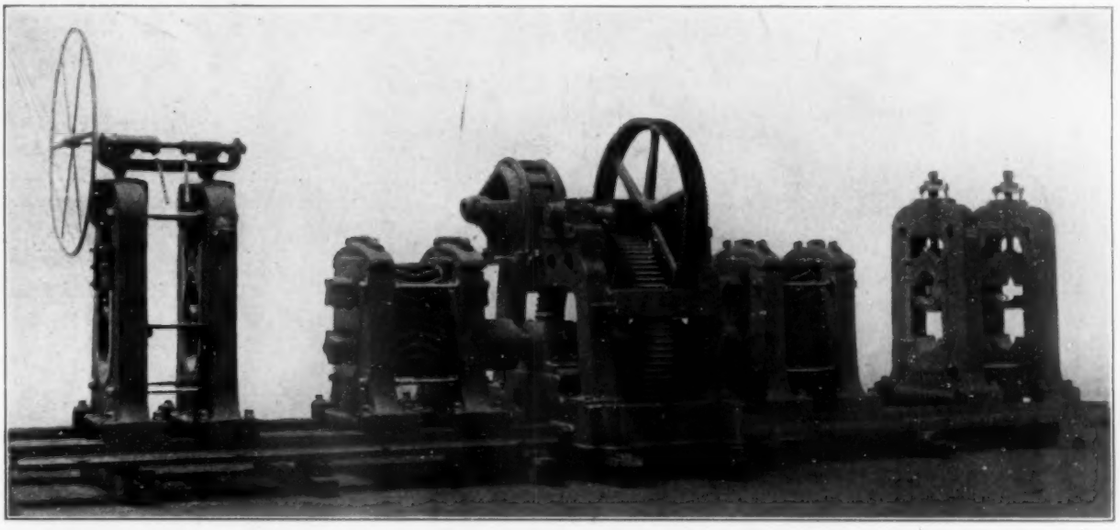
The above points and illustrations will serve to show how the industry was first started, and it is proposed to show in a following article how the drum type of draw bench has been improved with a view to increasing the efficiency of the machines by the introduction of various devices.

The industry of wire drawing received an enormous advantage by the introduction of grooved rolling, which is attributed to Cort; this, by cheapening the cost of production from the raw billet and enabling a long stretch of wire to be produced, called for more efficient machines to meet with the greater demand.

ELECTRIC POWER IN BRASS MILLS.

By Geo. R. Terry.

The efficiency of the steam engine as a driver of roll trains in a sheet brass mill appears to be considered so good by the engineers of such plants that they hesitate to adopt electric drive to any great extent, although the field apparently contains some very great economies to be obtained by the use of electric motors for such work. However, assuming that the retention of the steam engine is desirable for this class of work, electric drive in other departments of a brass mill may be obtained with great economy by utilizing the exhaust from the engines to drive low pressure turbine-generators.

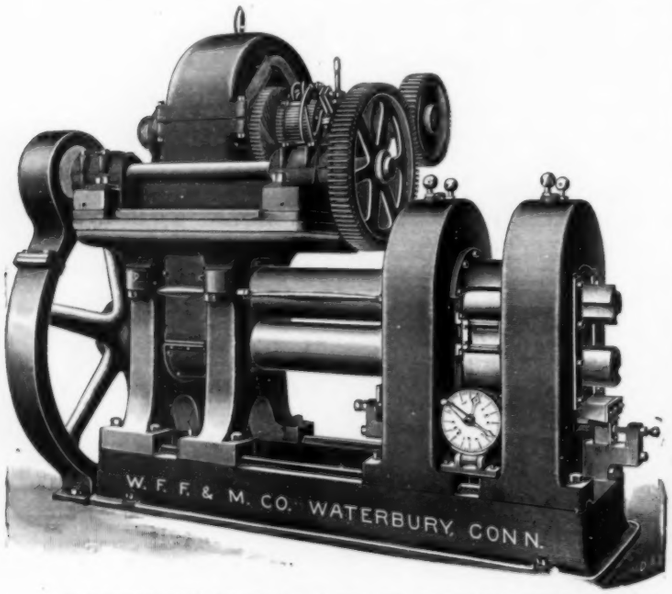


ROLLING MILL DRIVEN BY ELECTRIC POWER. MANUFACTURED BY THE FARREL FOUNDRY AND MACHINE COMPANY, ANSONIA, CONN., FOR THE AMERICAN OPTICAL COMPANY, SOUTHBRIDGE, MASS.

Let it be assumed that a 1,000 h. p. compound condensing engine is driving a train of rolls. The load on the engine is fairly constant with now and then a more or less violent fluctuation. By the use of a receiver proportioned to suit the nature of the fluctuations, located between the engine exhaust and the turbine intake, a practically constant supply of steam is delivered to the turbine, which exhausts into the condenser. A 1,000 KVA generator is probably as large as could be operated to advantage on such an engine, and it should be of the three phase, non-synchronous type, with leads running directly to a switching panel on the switchboard, from which point the turbine governor should also be controlled. Such a type of generator is especially adapted to this class of work, as it may be connected directly to the distributing system without any control apparatus or wiring other than that pertaining to the governor. The characteristics of the current generated are controlled by means entirely independent of the machine, and which may be connected into any part of the system feed by the generator. The absence of any slipping contacts, exposed wiring or mechanism of any kind other than the shaft bearings, allows placing the machine in any convenient situation regardless of how remote it may be from the switchboard or the power house. It is desirable to be able to control the governor from the switchboard, however, though not absolutely necessary.

The switchboard is assumed to be located at some central point in the plant from which the feeders run

to the various departments, and which is usually the old generating station, probably near the boiler plant, furnishing light and scattered power about the mills. Here a 300 KVA, 3 phase, 60 cycle, 480 volt, synchronous generator high pressure turbine unit should be installed, or if the plant contains a generator of similar characteristics, it may be retained and only the non-synchronous generator installed. With this arrangement the switchboard attendant has full control of the non-synchronous machine, the engine attendant simply looking after the oiling and maintenance of the equipment. The synchronous machine controls the voltage and frequency of the system and furnishes excitation for the non-synchronous machine



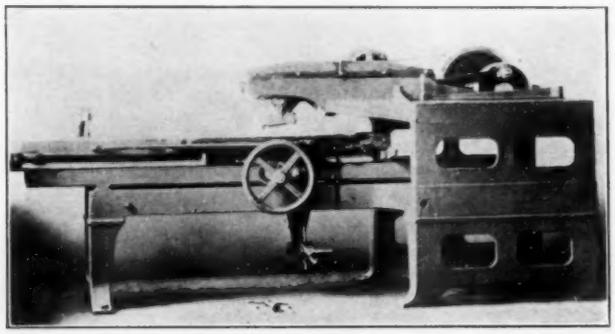
ELECTRICALLY DRIVEN 10½ BY 9 IN. PORTABLE ROLLING MILL WATERBURY FARREL FOUNDRY AND MACHINE COMPANY, WATERBURY, CONN.

which supplies the power in the system up to its capacity, beyond which point the synchronous machine may furnish power also. This machine must supply all the exciting current required by the motors, etc., on the lines; in other words, this machine furnishes all the so-called wattless current in the system.

Up to the full capacity of the non-synchronous machine, practically the only coal used to supply power other than that required to drive the rolling mill engine, is that necessary to generate the exciting current for the system. The power thus secured from the exhaust of the rolling mill engine will be sufficient, in the average plant, to drive the pumps operating the tube mill hydraulic draw benches and the shafting driving the cable draw benches, wire drawing blocks, straighteners, saw, shears, cranes, blowers, pumps and nearly all the other power required by the plant, while at the same time the boiler plant reserve will be increased by the reduction of the live steam consumption so effected. When it is considered that the non-synchronous machine will deliver approximately as much power from the steam exhausted by the engine as that engine is delivering from the live steam it takes, one begins to realize the betterment of economy that may be obtained in the generation and utilization of power in the brass manufacturing industry.

Suppose the assumed 1,000 h. p. engine to operate at full load ten hours a day for a year of 300 days, which equals 3,000,000 h. p. hours per year. At ⅓ cent per h. p. hour for the steam delivered to the engine, the total cost for steam is $10,000 per annum. By the addition of the low pressure turbo-generator, which would cost in the neighborhood of $30,000 to install, the output is doubled at the same total cost for fuel, or the cost per h. p. hour is reduced 50 per cent. The annual interest on the cost of the installation at 5 per cent. plus 3 per cent. for maintenance and depreciation equals $2,400, and the power it will deliver, based on cost of generating by live steam plus the interest on the apparatus to develop it, is worth approximately $12,500, so that by its installation, $10,000 worth of power is obtained for nothing; or $10,000 saved per year. The reduction in the amount of steam drawn from the boilers, previously referred to, is effected by substituting motors for steam engines, the motors deriving their operating energy through the generator from the exhaust of the rolling mill engine. The figures given are, of course, only approximate, and are used for the purpose of explanation in the attempt to show how great the cost of power in these plants can be reduced. Summed up in general, the proposition means:

(1) The installation cost of generating unit.



MOTOR DRIVEN OVERHAULING MACHINE. WATERBURY FARREL FOUNDRY AND MACHINE COMPANY.

(2) Securing the additional power without increase of boiler plant or fuel consumption.

(3) The consequent reduction in cost of power.

By a careful investigation of conditions in individual cases and estimates based thereon, a very accurate idea can be obtained of the actual savings that can be made in any case.

COPPER TRADE REVIEW.

German Production and Consumption—New Companies.

The following review of the world's copper trade for last year is condensed from the annual report of a German authority by United States Consul-General Richard Guenther, of Frankford:

Last year 194,449 metric tons (of 2,204.6 pounds each) of copper were consumed in Germany, about 5,000 tons over 1908. About 90,000 tons were used for electrical installation, 38,000 for manufacturing plates, bars, and tubing, 41,000 for making brass, 2,000 by chemical factories, and about 23,000 by shipyards, railroads, and for copper fittings and armatures. Germany produced 31,009 tons of copper, including that made from imported ores and scraps. The world's production of copper in 1909 is estimated at 834,940 English tons, in which the following countries were the principal participants: United States, 487,020 tons; Mexico, 56,250 tons; Spain and Portugal, 53,000 tons; Japan, 45,000 tons; Australia, 38,350 tons; Chile, 35,800 tons; Germany, 23,500 tons.

PATENT CONTROVERSY OVER BEARING METALS.

SEVENTH PAPER DEALING WITH THE QUESTION OF PRIORITY OF THE INVENTION OF COPPER-TIN-LEAD ALLOYS.

BY ANDREW ALLAN, JR.*

Through the columns of THE METAL INDUSTRY of July, 1909, I took upon myself the responsibility of discussing a paper on "The Patent Situation in the United States Respecting Alloys." prepared by Mr. G. H. Clamer, and read at the American Foundrymen's Association's convention at Cincinnati, May, 1909. I was moved by absolute faith in my convictions, that any foundryman has a legal right to manufacture lead-copper alloys, with or without tin; that this art was invented by Andrew Allan, Sr., in 1876, and as he had never applied for patent rights, the field was open to all. I pointed out in a following paper that not until several years after Andrew Allan, Sr., placed on the market various alloys of Allan metal which had become generally known throughout the States, did there appear on the market a lead-copper alloy that would hold up more than 15 per cent. of lead, with or without tin, without the use of nickel.

ALLAN BRONZE NO. 1.
COPPER, 61.39; TIN, 10.01; LEAD, 27.60 PARTS.

When I entered this controversy I did not expect, in fact, it would be hardly reasonable for me to suppose, that Mr. Clamer would agree with me in my contentions. I merely presented my case in as concise and candid a way as my limited ability as a writer would permit, endeavoring to state the facts as I see them. I do not in any way wish my readers to think that I hold Mr. Clamer's metallurgical ability lightly. In replying to Mr. G. H. Clamer's paper, published in the May issue of THE METAL INDUSTRY, I would call my readers' attention to the November, 1909, issue, in which Mr. Clamer states:

"I am perfectly familiar with the fact that lead, tin and copper can be mixed, and lead held in suspension in small and rapidly chilled castings, without adhering to any particular proportions of copper and tin, but have never seen castings produced in a commercial way which will vary widely from the proportions of our plastic bronze patent, without showing what is commonly known in the foundry as 'lead sweat.'"

From Reissued Letters Patent, No. 12,880, we read:

"The invention therefore consists not in the establishment of exact and rigid proportions, but in the discovery of the application of the critical relation between tin and copper required to make possible high percentage of lead.

"In the described improvement we have discovered that a much higher percentage of lead, which is desirable, can be added to such alloys containing less than 7 per cent. of tin than can be added to such alloys containing more than 7 per cent. of tin."

In the foregoing Mr. Clamer clearly states his views on the critical relation between tin and copper required to make possible high percentage of lead, on which he based patent rights for the discovery thereof. In the February, 1910, issue of THE METAL INDUSTRY

ALLAN BRONZE NO. 2.
COPPER, 56.60; TIN, 9.96; LEAD, 32.47 PARTS.

I exhibited photomicrographs of several of our alloys, namely: No. 5, 11 parts tin to 89 parts copper in the mix; No. 6, 12 parts tin to 88 parts copper in the mix; No. 7, 13 parts tin to 87 parts copper in the mix, and No. 8, 14 parts tin to 86 parts copper in the mix. These alloys absolutely contradict the establishment of a critical relation between tin and copper required to make possible high percentage of lead, 9 parts tin to 91 parts copper in the mix.

Now, in the May, 1910, issue of THE METAL INDUSTRY, Mr. Clamer states:

"I am perfectly familiar with the fact that copper-lead and tin can be mixed in proportions as set forth by Mr. Allan, having covered this ground a number of years ago when studying copper-tin and lead compositions in every conceivable combination, so that the matter which he now presents is not new to me at all."

* Andrew Allan and Son, New York.

I would like to ask Mr. Clamer why he made the statement in the November issue above, and why he applied for patent rights on the discovery of a critical relation between tin and copper required to make possible high percentage of lead, 9 parts tin to 91 parts copper in the mix, when, as he states in the May, 1910, issue, that for years he was aware that lead-copper and tin compositions could be made of the following proportions?

Copper.	Tin.	Lead.
70	10	20
67	9	24
62½	7½	30
58½	6½	35

In the May issue of THE METAL INDUSTRY Mr. Clamer states:

"In my own experience, I have found that the limit of the amount of lead added with 10 per cent. of tin was somewhat above 20 per cent.; with 8½ per cent. tin somewhat above 25 per cent.; with 9 per cent. of tin somewhat above 23 per cent."

In the year 1903, in a paper read by Mr. Clamer, at the Franklin Institute, he states:

"We were able to produce, without difficulty, alloys with 5 per cent. tin and 30 per cent. lead, but were unable to obtain castings containing 30 per cent. lead, if the tin exceeded 6 to 6½ per cent., nor could we produce castings with even slightly over 20 per cent. when 7 per cent. of tin was exceeded."

I would like to quote here from a paper by Mr. Clamer, read at the Franklin Institute, July, 1903:

"We gave the matter careful attention, and carried on an elaborate series of experiments, but time will not permit me to go into details of same; but suffice it to say that the fact was discovered that a certain amount of tin was necessary for retaining the lead without segregation, and also to give the alloy requisite strength, but that a greater amount is exceedingly detrimental."

Mr. Clamer states in his May article:

"I wish Mr. Allan would show to the readers of your valuable paper bearings made in accordance with the mixtures mentioned in his discussion in the September, 1909, number of THE METAL INDUSTRY. Exhibit the bearings at the office of THE METAL INDUSTRY and show photographs of journal bearings made from these mixtures. Should he be able to make such mixtures by means of the 'Allan Process' I will freely grant that he is able to do something by means of this process which cannot be acplished by ordinary foundry practice."

I am pleased to accept Mr. Clamer's suggestion and have forwarded to THE METAL INDUSTRY journal bearings, as requested, asking that journal to have same analyzed and report their findings through the columns of their valuable paper.

Mr. Clamer states:

"Mr. Allen, it will be noted in the experiments, etc."

These "experiments" are in reality, real live merchantable products.

Mr. Clamer states:

"Mr. Allan has evidently confused the curve of the Alloys Research Committee showing the whole series of copper lead alloys with the curve prepared for him by Messrs. Sauveur and Boylston, showing the freezing point curve of but one alloy in the series, i. e., that of Allan's metal No. 1."

There was no confusion on my part. In the February issue I conceded technical error in the publication of one of our bulletins in quoting 1500 degs. Fahr. I presented Messrs. Sauveur and Boylston's curve to show complete freezing curve of Allan No. 1 metal and would ask on what authority Mr. Clamer bases his claim that the copper constituent in the Allan No. 1 metal commences to solidify at the solidifying point of pure copper? I claim that this is not scientifically correct, that the copper constituent of the Allan No. 1 metal does not commence to solidify until about 1796 degs. Fahr. Therefore lead does lower the freezing point of copper considerably as stated in my September paper and as is shown by the curve of the Alloys Research Committee, mentioned above.

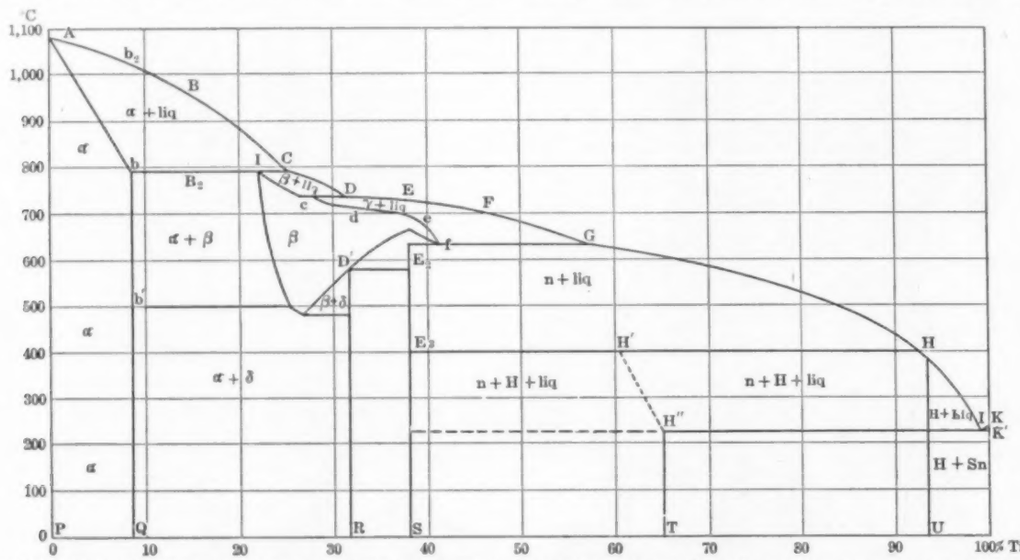


DIAGRAM OF MESSRS. HEYCOCK AND NEVILLE, SHOWING COOLING CURVE OF ALLOYS OF TIN AND COPPER.

Mr. Clamer, in his efforts to answer my interpretation of the equilibrium diagram of the series of copper and tin alloys, established by Messrs. Haycock and Neville, produces the testimony given at the late trial by Dr. Albert Sauveur. Professor Sauveur's opinion coincides with Mr. Clamer's, on this supposed critical point, which I maintain does not affect the case. I grant that the 9 per cent. alloy of copper and tin freezes at 1020 degs. Cent. to 790 degs. Cent., but that an alloy of 7 per cent. tin, 20 per cent. lead and 73 per cent. copper freezes in this range, seems most improbable. The addition of lead should materially alter the freezing points.

According to the Haycock-Neville curve, which is here shown (Fig. 1), the 9 per cent. alloy has a greater freezing range, in degrees Centigrade, than alloys with more or less tin. The time of freezing at the line b I C, increases from zero to a maximum, as we increase the percentage of tin from 9 to 22 per cent., but that increase is perfectly proportional to the increase in tin; in other words, b I C indicates the heat evolved by the formation and solidification of the constituent B.* Hence there is no abrupt change at 9 per cent. tin, but the change is gradual and reaches a maximum at 22 per cent. tin.

The point b at 9 per cent. tin in the Haycock-Neville diagram applies only to alloys very slowly cooled. For cast alloys it is a well known fact that the point b is moved to the left and is less than 9 per cent. tin. Therefore this so-called critical point varies with the rate of cooling, to come down to practical alloys.

Mr. Clamer concludes with the following phraseology:

"I am quite well satisfied that the statements made by Mr. Allan in his discussion, which has appeared in this paper, also his circular covering Allan's Metal, have not been made with any attempt at deception, but are entirely in accordance with his own understanding of the facts, which, however, as I have pointed out, are not scientifically correct."

Modesty is a commendable virtue in the humble and learned alike. The merits of the claims set forth in this controversy must be decided by the readers of THE METAL INDUSTRY, whom I believe are fully capable of drawing their own conclusions.

CONCLUSION.

Does not the presence of the eutectoid of Cu_4 Sn in the Allan bronzes, referred to in my February paper, show that the critical point of the copper-tin series has been passed and as merchantable castings can still be made, the critical point of the copper-tin series can have no bearing on the lead content of the alloy?

In other words: Does not the presence of the eutectoid wholly disprove that a critical point has been established between tin and copper, which is necessary to make possible high percentage of lead?

Does the fact that the Haycock-Neville curve shows change in construction at 9 per cent. tin, influence the amount of lead which can be added to copper-tin alloys without showing segregation? Also is this change of such a nature that it causes an abrupt change in the copper-tin-lead series?

Should an alloy of 15 parts tin to 85 parts copper, having a freezing range of only 170 degs. Cent., allow any more or as much segregation when lead is introduced, than an alloy of 9 parts tin to 91 parts copper having a freezing range of 230 degs. Cent.?

Does not our alloy prove that the time interval b to B_2 has no effect on giving an opportunity to the lead to separate out?

Hence we must conclude, this series of alloys depends upon how to control the lead, which is the Allan process, and is applied to copper without and with tin up to amounts beyond the practical limits for hardness and not upon the critical point of 9 parts tin to 91 parts copper in the mix.

I should think it would be very interesting to the readers of THE METAL INDUSTRY, interested in bearing metals, if Mr. Clamer would place on exhibition at your office a journal bearing made of the mixture mentioned in his article in the May issue of THE METAL INDUSTRY, viz.: Copper 55 and lead 45 parts, also journal bearings made of the following mixtures which he states can be made by ordinary foundry practice:

Copper.	Tin.	Lead.
58½	6½	35
62½	7½	30
67	9	24
70	10	20
65	5	30

I would be pleased to submit journal bearings made of the same mixtures, by the Allan process, for comparison.

*Which, of course, changes into the eutectoid at about 500 degs. Cent.

Upon the request of Messrs. Andrew Allan and Son, THE METAL INDUSTRY received the bearings mentioned in the above article and has had them analyzed. These bearings are marked No. 1 and 2 and are now on exhibition at the office of THE METAL INDUSTRY, 99 John street, New York City. The report of the chemist follows:

LEDOUX & COMPANY,
ENGINEERS, CHEMISTS AND ASSAYERS,
99 JOHN STREET. NEW YORK.

CERTIFICATE OF ANALYSIS.

Nos. 152054-152547.

New York, **June 20, 1910**

The Samples of **BRONZE BEARINGS**
From **THE METAL INDUSTRY,**
Marked: **Nos. 1 and 2**
and **submitted to** us for analysis, contain:

	No. 1	No. 2
Copper - -	**61.39%**	**56.60%**
Tin - - - -	**10.01%**	**9.96%**
Lead - - -	**27.60%**	**32.47%**
Sulphur - -	**0.89%**	**0.87%**
Arsenic - -	**0.027%**	**0.018%**
Iron - - -	**0.049%**	**0.055%**

To **THE METAL INDUSTRY**
99 John Street, New York

Ledoux & Co.

TANTALUM.

Tantalum is a "rare metal" of slight importance, the only practical use to which it is now known to be put being in making filaments for incandescent electric lamps. The efficiency of the tantalum lamp is greater than that of the carbon lamp, but somewhat less than that of the lamp with tungsten filament. As more than 20,000 filaments of 20 candlepower can be made from a pound of tantalum the market is not large. It is at present probably supplied by rich manganotantalates from Western Australia. No tantalum minerals are known to have been produced in the United States in 1908, according to F. L. Hess, whose report on various rare metals forms an advance chapter of "Mineral resources of the United States, calendar year 1908," published by the Geological Survey. The tantalum used in the manufacture of lamps in this country is made in Germany and imported at a cost of $300 or more a pound.

THE PRACTICAL ELECTRO-DEPOSITION OF GOLD

AN EXHAUSTIVE TREATISE ON THE SO-CALLED ROSE ROMAN, GREEN GOLD AND SIAMESE FINISHES, TO BE CONTINUED FOR SEVERAL ISSUES.

(Continued from May.)

BY AUGUST HOFFMAN.*

HOW TO FINISH ARTICLES IN ROSE GOLD.

It may be well to state that this finish shows to the best advantage on heavy relief work, as the rose finish is little used on plain goods, also that some taste and discretion is necessary in shading the article so as to give them an artistic appearance. The following solution, which is known as the rose solution, is made in this manner:

Take 3 half pints of clean cold water and allow to boil; now add 3 ounces of cyanide of potassium, ½ ounce of ferro cyanide of potassium and ½ of a stick of caustic potash; when these salts have dissolved add 8 ounces of the "Fine Gold Solution" and 15 grams of pure ammonium chloride, after which add water to make 1 quart and use the solution at 160 degs. Fahr.

This solution, if worked carefully as described below, and made as the formula prescribes, will give an orange tint to the background of the article when finished, which is a much desired shade. To produce this finish the article must be cleansed and prepared in the same manner as for Roman gold.

It is then worked in the rose solution in the same manner as the Roman solution is used, only in place of immersing one-half of the anode it should be placed entirely into the solution and worked until a deep brownish red smut appears over the article, which usually takes about 5 minutes. When this smut has been obtained, which is ascertained by lifting the article out of the bath from time to time, it is rinsed in a bowl containing clean water, which has been previously placed before the solution and from this laid into a bowl of clean water.

Now place some bicarbonate of sodium into a wooden box (or any article into which the hand can be placed conveniently) and proceed as follows: Let us suppose that a bracelet is being finished in rose gold (as an example to the operator), which is chased on the outer part, and of a plain surface on the inner side. The bracelet is taken from the bowl and with a swing of the arm, shake off the excess water and with the thumb of the free hand (which should be moist) place some bicarbonate of sodium on the outer part of bracelet, and rub gently but firmly in a backward and forward motion, replenishing with soda when needed and continued until all the outer surface has been rubbed over, when it should be rinsed thoroughly in clean water.

The article should now appear to have a lusterful Roman color on the high relief parts, while in the background the same smut as before mentioned will be visible, which are the two contrasts to the rose finish. If the article does not have enough luster on the high relief parts, it can be rubbed again with the soda as described before, until it does, after which operation it is taken to the scratch brush and brushed with the one row brush on the inner side only, care being taken not to hit the outer part, as a touch from the brush will spoil the effect.

The inner side should be brushed until it appears the same as an article done in Roman gold, when it is ready for the finishing solution. It is now rinsed in clean water and put through the same as articles done in Roman gold already described and dried in clean sawdust. It is advisable to state that this finish is very delicate and care should be taken not to scratch or rub the article against any hard surface when drying, brushing or in fact during any part of the operation, as scratches mar the beauty of this "the rose gold finish," which is the most desirable on all high relief jewelry.

THE PROCESS OF PROCURING THE GREEN GOLD FINISH. LIGHT AND DARK.

It is universally known, that to make a green gold it becomes necessary to compound the two precious metals of silver and gold, and the same holds good in the making of a green gold solution. Of course it may be readily understood that different shades can be obtained, that is to say, a yellowish green, which contains an excess of gold and a light or silverish green, which contains an excess of silver, and that in the deposition of green gold the chemicals used also help materially to alter the color of the deposit, and many shades can be found on the market. The writer desires to bring to notice the two finishes most used at the present time, which is a light and a dark green.

A light green solution is made by boiling 3 half pints of clean water in a dish, then add 3 ounces of C. P. cyanide of potassium, 1 ounce of ferrocyanide of potassium, 1 stick of caustic potash and 1 ounce of pure ammonium chloride, allow to dissolve and add 6 ounces "Fine Gold Solution."

Now dissolve 1 ounce of nitrate of silver crystals in 20 ounces of clean water and when thoroughly dissolved allow to cool and place in a bottle labeled "silver." Now add 1½ ounce of "silver" to the above gold solution and sufficient water to make 1 quart which becomes a green gold solution and is known as such and should be used at 100 degs. Fahr.

Stir this thoroughly and take the platinum anode from the positive wire and place on the end of the negative wire. An anode of green gold the same size as the platinum should be attached to the positive pole. This anode should be about 18 karat and should be used when operating the solution in place of the platinum. Now hang both pieces into the bath and when a green gold deposit shows itself on the platinum it is ready to use. This is done to draw the two metals together and put the bath into perfect order.

Sometimes a drop or two more than is necessary of either metal (silver or gold) will vary the color and in either case the opposite must be added drop by drop until the desired color is obtained: for instance, if the deposit is too white more gold is wanted, if too yellow more silver. When the desired shade shows itself on the platinum, it is removed from the bath, taken from the cathode wire and is allowed to suspend from a wire hung over the side of the dish into the solution, the gold deposited thereon will again dissolve into the solution, which when used plates a smut as mentioned for rose gold, but of a green color.

Articles to be finished in green are prepared and cleansed as for roman gold, then plated in the same manner as the rose solution is used and when the desired smut is obtained removed and rinsed in clean water as explained for rose gold. Plain articles are scratch brushed very lightly with a one row brush using plenty

*Foreman Plater J. K. Osborne Manufacturing Company, Harrison, N. J.

of soap bark water, then rinsed thoroughly, first in clean cold and then in hot water and dried in sawdust. Articles with a high relief should be rubbed over the high parts with bicarbonate of sodium the same as rose gold is finished and brushed on the plain parts, then rinsed and dried as explained before.

The dark green gold is only used on articles with a deep background and is made up as follows: Take, ½ ounce of white arsenic, in ½ quart of water, to which add 6 ounces of C. P. cyanide of potassium, and allow to boil.

When these ingredients have been thoroughly boiled and dissolved the solution will have a very dark brown color, after which it should be allowed to cool, then poured into a bottle and labeled "arsenic solution." It may be well to state that the operator take care and not inhale the fumes of gas arising from the solution while boiling, as they are very injurious and unpleasant; also to be very careful not to get a drop into any solution where it is not wanted as it would affect it and produce serious results, which would be hard to overcome.

Now proceed to make a light green gold solution as before mentioned and allow to cool to about 80 degs. Fahr. Then arrange the platinum as before mentioned and while it is plating on the cathode wire, add one drop at a time of the arsenic solution until the deposit on the platinum appears as a dark green smut. This solution should be used at not more than 80 degs. Fahr. Then proceed as for light green using same kind of green gold anode, and articles to be finished herein are plated until a dark green smut appears, then rinsed in clean water and rubbed with the bicarbonate of sodium, brush lightly on the plain parts and then thoroughly rinsed, first in clean cold, then in hot water and dried in sawdust.

Great care should be exercised in adding the arsenic solution and should be done very slowly as a few drops in excess will destroy all traces of the gold and give a dark grayish deposit in which case it becomes necessary to add "Fine Gold" and "Silver" solutions (8 parts gold, 1 part silver) gradually until the green gold again appears. If the arsenic solution has been carefully made and the evaporated water replaced to make the full two pints, the operator will generally find from five to ten drops sufficient to give the desired shade, which on the finished article is generally known as "Antique Green Gold." (To be Continued.)

LACQUERS FOR DECORATIVE PURPOSES.

A Dissertation on the Subject of Lacquering.

By Frank P. Davis.*

Lacquers were invented to protect metals from tarnishing. They were originally made of shellac and grain alcohol, and a lacquer man's trade was his knowledge of their manufacture. Even at that time the idea of using lacquers for decorative purposes was shown in the efforts to produce gold lacquers by coloring with dragon's blood, gamboge, tumeric, aloes, saffron, etc. Later on, following the invention of celluloid lacquers, aniline dyes came into use, but with the exception of yellow gold colors used on bedstead work their use has been limited to cheap toys and corned beef cans, owing to their fleeting nature and the difficulty of obtaining delicate or pleasing colors.

FRANK P. DAVIS.

Black lacquers were an easy problem for the manufacturers, owing to the fact that black pigments are extremely light in weight and the solvents may be saturated with black dyes which are fast. White lacquers and colors were altogether another problem. White and colored pigments are heavy; that is, those that are fast to light. It is also obvious that they may not be strengthened up with anilines and maintain any reasonable degree of permanency.

The law of supply and demand is a trade term. In this particular instance it is the writer's opinion that the demand preceded the supply. If a demand is persistently insistent the supply is apt to follow. It is true in this case, for there is now upon the market a full line of solid color air-drying lacquers, ranging from white down through the scale and in any degree of depth of color, from tints and shades to full tones, and all fast to light. They are especially suitable for wood finishing, buttons, millinery flowers, plaster casts in imitation of cast metal, and fancy goods of every description.

The greens may be used in producing verde antique in place of the acid process which frequently continues its corrosive effects after the work is complete. On builder's hardware the browns rival the oxidized copper effects, which have certainly had a long life.

The body stock of the colored lacquers is made up of especially tough material, and the pigments give added wearing qualities to the lacquer. Pigment lacquers may be reduced with the body stock to show semi-transparent to suit the fancy of the user, without injuring the permanency of the color. In this case the color of the underlying metal will have its effect and by easy manipulation the results may be extended indefinitely. By the same methods they may be made to dry glossy, or from an egg-shell finish through velvety finish to a full matt surface.

For semi-transparent and oxidized effects the spray is essential, but as most every one is using it, or preparing to do so, this offers no objection. If any plater or lacquer man desires further information upon the subject, and will address me, care of The Metal Industry, I will be pleased to extend such advice as I am able to.

*Celluloid Zapon Lacquer Company, New York.

TIFFANY GREEN FINISH ON BRASS AND COPPER.

The following directions are given for producing this popular finish:

For 1 gallon of solution use:

Water	3	quarts
Hydrochloric acid	1	"
Verdigris	3	lbs.
Copper carbonate	1	"
Arsenic, powdered	½	"
Muriate of ammonia	3	"

Mix well, dissolve by boiling about 15 minutes, let settle for about 10 hours and apply it as other greens are used.—John F. Fleckenstein.

THE DEVELOPMENT OF ENGLISH MELTING FURNACES.

A Description of Some of the Latest Types, From the English Viewpoint.

By E. L. S. N.

The interesting article, "The Development of Melting Furnaces," a description from the earliest to the latest types, by L. J. Krom, which has recently appeared in this journal,* has aroused considerable interest among those readers who are only conversant with the "Pit" type furnace, which until quite recently, has held the field to the exclusion of other types. Unfortunately, however, only furnaces, with one exception, made in America were described and as there are several firms in England who are making furnaces, specially suited to local practice, the writer thinks that a description of the leading types may be of interest to the readers of this journal as showing the progress, however slow it may seem to be to some, made in metal melting. Another important reason why firms must be conversant with the latest and improved furnaces is because of the recent acts, which have come into force at the beginning of this year, as regards metal casting, causing employers to look to the best means to cope with the new regulations, which threaten to increase the cost of production, and also to place manufacturers in the position of being able to turn out their work at the lowest possible cost in order to meet successfully the increasing competition, not only from local, but foreign firms, which threatens extinction to all, but those absolutely up to date in every respect.

The Pit type furnace has still many adherents, and there is no doubt with the improved designs will still be used to a certain extent, but to the general metal caster the self-contained portable or semi-portable furnace offers many advantages, and this is proved by the increasing number of firms in England who are using them, in many cases to the total exclusion of the older type, to say nothing of the firms in America and on the Continent, where the new type has made more headway than in England; but England has always been very conservative in adopting new ideas, especially when they come from abroad; but as this has now been overcome we may confidently look during the next few years to their installation in practically every foundry. Their advantages may be roughly enumerated as follows:

1. Less fuel used per pound of metal melted.
2. Metal melted in less time, hence greater number of heats per day and increase in output.
3. The furnace can be placed at the side of the molds, insuring hot metal and good running.
4. Less floor space required, this being an important matter in towns, where every square foot means money.

These furnaces can be divided into two classes, viz., The stationary or non-tilting type, and the tilting type.

Both types of furnaces have their advantages and disadvantages. The tilting type furnace has an arrangement whereby the whole body of the furnace is tilted over the mold when pouring, thus doing away entirely with the necessity of lifting the crucible out of the furnace and carrying it to the mold, insuring absolutely hot metal, practically non-oxidization of the metal and longer life to the crucible, as the latter remains in the hot furnace and is thus protected from coming into direct contact with the cold air, which causes sudden contraction so destructive to the life of the crucible, to say nothing of the cooling of the furnace itself and the extra heat required to bring both crucible and furnace back to their proper temperature during the next melt. The chief disadvantages of the tilting type are that substantial firebrick supports must be placed round the crucible to keep it in position when pouring and this prevents the heat from reaching those parts of the crucible in contact with the supports, tending to cause unevenness in the temperature of the metal, which means uneven running of the metal and faulty castings; unevenness in the temperature of the crucible with the resulting tendency to warp and sometimes crack; extra fuel required each melt and longer time to bring the metal down, which means less number of heats per day.

Some furnaces are much worse than others in this defect, but all suffer to a certain extent, although the defect has been minimized as much as possible by improvements in the manner of securing the crucible during the last year or so. The stationary or non-tilting type of furnace does not suffer from this defect, as the crucible simply rests on a firebrick during the time the metal is being melted and lifted out of the furnace altogether when the metal is being poured; hence there is no need to support the crucible in any way around the sides, so that the crucible and the metal are heated evenly throughout. Fuel is another important question to be dealt with, as coke, gas and oil are being extensively used now, although oil is not used to anything like the same extent in England as it is in America, this is solely due to the fact that the fuel is so much cheaper, in the latter country, especially the crude or black oil, but there is one firm in England who specialize in oil as a fuel and according to all accounts, are making a success of it, in spite of the comparatively high cost of the fuel, and are able to equal gas or coke as regards cost of using, thus placing the foundry in the country, where gas cannot be obtained, and coke only at a very high price, on practically the same terms as those foundries situated in towns or commercial centers, where gas or coke may be obtained at a reasonable rate. This, of course, is a very important consideration, as it will probably be the means of inducing casters to spread out more into the country districts, instead of being concentrated in large centers, and where the surroundings and conditions of working are detrimental to the caster.

For country districts oil is the cheapest fuel, as crude oil at 3d. per gallon can be used, which gives as much heat as 150 cubic feet of gas, and taking the latter at 18d. per thousand cubic feet (average price for large towns), the relative costs work out about equal. For use in towns the writer thinks that gas is preferable to oil, as the latter needs being stored in fairly large quantities, which takes up valuable room, as the by-laws will not allow oil in bulk to be kept only under rather stringent conditions. Gas gives absolutely no trouble in working, and although vast improvements have been made in the construction of oil burners, as regards their reliability in working, yet it is perfectly obvious that they work under different conditions. The gas burner has only to mix the proper amount of air for the quantity of gas passing, whereas the oil burner has first of all to turn the oil into a gas and then mix the proper quantity of air, so that the oil burner has much more work and of an intricate nature to perform than the gas burner, hence it follows that the oil burner breaks down at times, and also must be taken to pieces to be cleaned fairly frequently, and another thing, oil is not so clean in use. Coke as a fuel is still the most used, but this may be accounted for by the fact that most foundries still use the

*The Metal Industry, August-December, 1909, and February, 1910.

pit type furnace and coke is universally used in them. The relative advantages of gas and coke are about equal, as where one is expensive then the other is also, as coke is the residue left when the gas has been extracted from the coal. Coke gives more trouble than gas as the furnace has to be fed regularly and carefully with the fuel, the firebars have to be cleaned at regular intervals, and have to be looked after nearly all the time to get the best results. Coke is, the writer thinks, the best fuel for large furnaces, say 500 to 1,000 pound sizes, as coke when not crowded into a little space can give out an intense heat. One advantage that gas and oil have over coke is, that when a blower is used, the burner can give off a practically unlimited supply of heat, if required, for a time, this being useful in many foundries. Another advantage, too, is that the temperature can be controlled within certain limits, this being very important with some of the alloys now being cast, not only from the molders' point of view, but also that of the metallurgist who has invented the alloy, as well as the engineer, who uses it. To sum up the whole thing, as to which kind of fuel is the best, depends entirely on the particular conditions attached to each case. For instance, a firm situated in the country, some distance away from coal fields, and therefore having to pay a high price for coke, owing to the carriage, would save by using oil; as in open districts, the storage in large quantities is not a serious matter, as it is in towns. Although for a very large foundry where furnaces dealing with, say 500 or 600 pounds of metal at one time, and working regularly, then coke would be a

FIG. 1. RICHMOND GAS FURNACE.

serious consideration, especially if melting ordinary mixtures. A firm situated in the town, where gas and coke are cheap, must then decide which is the better according to its own case. If a large and regular supply of metal is required, then coke would be preferable, but if the demand only requires a comparatively small supply, and that perhaps at intervals, then gas would be the cheaper. There is room for all three fuels in the market, as each one has its advantages and disadvantages according to the peculiar circumstances of the case. With these remarks the writer must pass on to describing the actual furnaces.

THE NON-TILTING TYPE FURNACE.

This type being the simpler in construction, the writer naturally takes it first, and Fig. 1 gives a general outside view, and Fig 2 a sectional view of the Richmond gas furnace, made by the Richmond Gas Stove Company, Ltd., Warrington, London, Eng. The construction is so simple that it can be seen practically at a glance. A is the outside shell of iron plates, containing a firebrick lining B, which rests on a strip of angle iron, riveted to the casing. C is a sleeve or cylinder smaller in diameter than the inside diameter of the furnace body, but has a shoulder or flange at the top, which fits the body, and not only keeps the sleeve central, but also prevents the heat passing up the sides and through the holes at the top of the sleeve from escaping, instead, they pass down between the sleeve and the lining, as shown by the arrows. The crucible E rests on a fireclay stand D, the inside being hollow and provided with a number of holes, as shown, to allow air to pass through F, the gas burner, which is in the form of a ring, to allow the stand D to be placed inside. The burner has an adjustable air inlet, to be used when lighting for preventing a "blowback." The burner being lighted through the door provided in the body of the furnace. G is a fireclay cover, fitted with a loose center, which can be lifted to allow inspection of the metal during melting. The cover is provided with handle to lift the cover off, when taking the crucible out of the furnace. The whole furnace rests on an iron

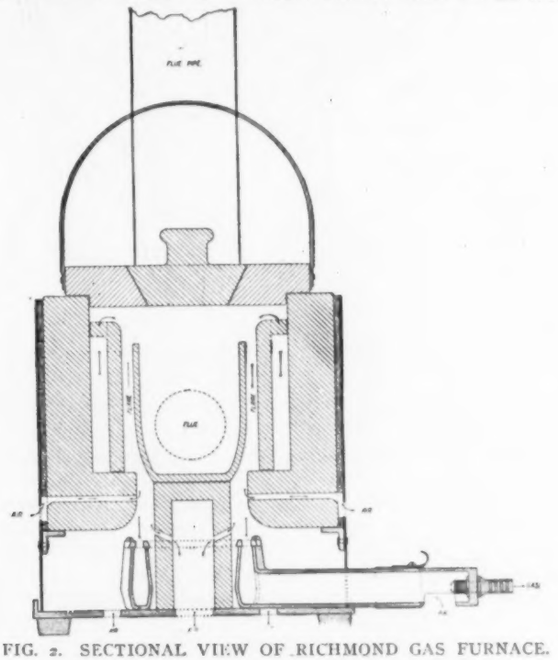


FIG. 2. SECTIONAL VIEW OF RICHMOND GAS FURNACE.

stand J, which is provided at the bottom with numerous holes to allow the air to pass to the burner. It is clearly seen that the gas at the point of ignition is met by several streams of air, which have been so arranged that the air gets heated by coming in contact with the firebricks, and by this means complete combustion and a higher temperature is insured. The heat after passing round the crucible, passes down the space between the sleeve and lining, by means of the holes in the top of the sleeve, and finally passes to the chimney through the flue in the lining which is represented by the dotted circle seen in the center of the crucible.

This furnace is very simple in construction and is designed with the view of getting the maximum efficiency with the minimum amount of outlay, and another important point is that any part can be replaced in a few minutes at a very little cost. The furnace is made in several sizes, the smallest melting 2 pounds of brass, and the largest (kept in stock), is capable of melting 36 pounds of brass, although larger sizes are made if desired, but the Richmonds have a furnace slightly different in

design to cope with the heavier work. This furnace has a crucible capacity of 70 pounds with a consumption of 125 cubic feet of gas per hour 15-10 pressure; the smaller furnaces using 40 cubic feet per hour in the 2 pound size, and 85 cubic feet per hour in the 36 pound size at the same pressure.

Fig. 3 shows, in section, a furnace by Messrs. Fletcher Russell and Company, Ltd. Warrington, which is very popular among the jewelry firms and others where only a small weight of metal is required, the smallest size melting up to 2 pounds of brass, and using 40 cubic feet of gas per hour, and the largest melting 6 pounds of brass, with a consumption of 60 cubic feet per hour. A is a fireclay body resting on an iron base B, containing the gas burner C and gas supply pipe D. The heat passing up and around the crucible E and thence up to chimney H. The cover F, which is of firebrick, need never be lifted off, as it can be pushed sideways to allow the cruci-

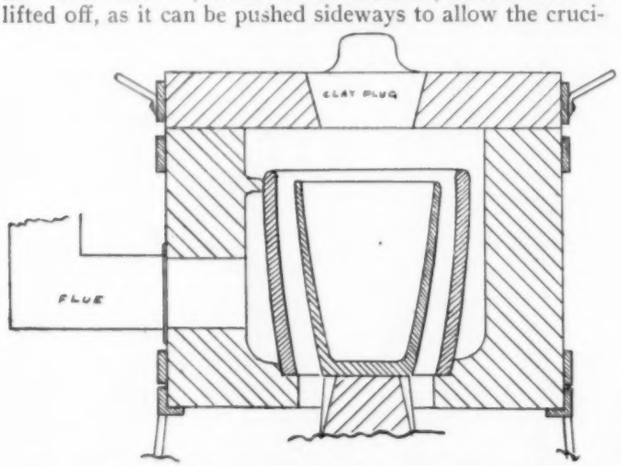


FIG. 3. SECTIONAL VIEW OF GAS MELTING FURNACE. FLETCHER RUSSELL & COMPANY.

ble being lifted out of the furnace when pouring. The cover is fitted with a loose center G of the same material to allow inspection of the metal when being melted.

Fig. 4 shows a new type of furnace, by the same makers, and intended for all purposes and temperatures, not exceeding the melting point of copper. The smallest size melting up to 2 pounds of metal, with a gas consumption at full power of 60 cubic feet, and the largest size furnace melting 120 pounds of metal with gas consumption of 160 cubic feet.

FORCED DRAUGHT MELTING FURNACES.

Many furnaces, especially those of a fairly large size and designed to melt metals with a high melting point, use forced draught, or air under pressure with the burners. The pressure being obtained by means of a Roots blower. One of the chief advantages obtained is the quickness in which a charge can be melted, as the burner can take two or three times the amount of fuel and burn it economically with the air under pressure, the explanation being, that a certain amount of gas requires a certain amount of air, for complete combustion; the ordinary burners can only pass a limited amount of air by the suction method. Hence if a greater quantity of gas is forced through the burner, then the amount of air mixing with it in the burner is not sufficient, with the result that the excess of gas is wasted, as it passes through the burner unburned; but with the air under pressure, then through a certain sized pipe the quantity of air passed increases with the pressure, hence it follows that with a certain size burner the amount of gas which can be consumed depends on the pressure of the air supplied.

Fig. 5 shows the outside view of a furnace made by the Richmond Gas Co., Ltd., and Fig. 6 a sectional view. It will be seen that the furnace consists of iron plates bolted together in box form, which contains the firebrick lining, the inside diameter containing the crucible, being, of course, circular. The pipe seen in Fig. 5 has two branches, one being for the gas and the other for the air.

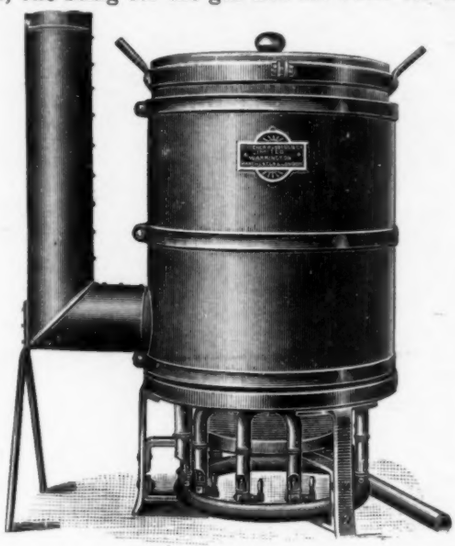


FIG. 4. NEW TYPE OF GAS FURNACE. FLETCHER RUSSELL & COMPANY.

The air and gas are therefore mixed just as they enter the burners at the point of ignition. The crucible rests on a solid firebrick stand around which the flames play. It will be noticed that about half way up the crucible the space between the crucible and the lining sharply contracts by means of a ring on the lining. This contraction

FIG. 5. RICHMOND GAS COMPANY, LTD., GAS FURNACE.

of the area through which the hot gases have to pass causes the latter to remain a longer time around the base of the crucible and there giving up the heat to the part of the crucible where it is required instead of passing rapidly to the top of the crucible and heating this part and then up the chimney. It will easily be seen that the top of

the crucible remains comparatively cool, while the bottom is receiving the heat and passing it to the metal. Another point is that when lifting the crucible out for pouring, the crucible is not so liable to collapse as when the top of the crucible is about the same temperature as the bottom, as owing to the pressure which is put on the sides of the crucible from the lifting tongues of irons, the cooler the top of crucible is the better. The furnace is fitted with

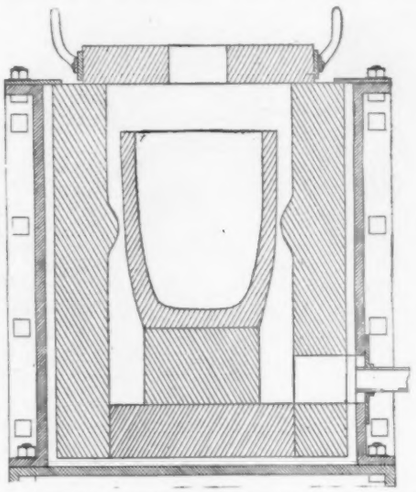


FIG. 6. SECTIONAL VIEW OF FURNACE SHOWN IN FIG. 5.

a loose firebrick cover with hole in the center for inspection purposes and also to allow the gases to escape.

Fig. 7 shows an outside view and Fig. 8 a sectional view of an oil fired melting furnace by Messrs. Allday and Onions, Ltd., Small Heath, Birmingham. The furnace is built of heavy steel plates, lined with 9 inches of best firebricks, and fitted with cast iron bottom and top plates and hood. The cover is usually supplied with rais-

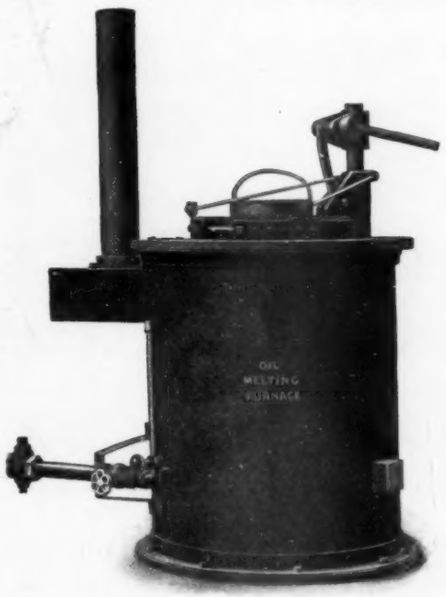


FIG. 7. ALLDAY & ONIONS' OIL FIRED FURNACE.

ing gear as shown in the illustration. The furhace is built sufficiently deep to allow for an old pot to be placed on top of the melting crucible, to assist in the running down of ingot metal, etc. The furnace is fitted with Messrs. Alldays patent burner, which has many advantages over the ordinary type. The proper proportion of air and oil for combustion is under complete control, being adjustable both for air and oil at the nozzle, hence when the volume of air or oil is adjusted, no alteration of pressure takes place as is the case when the adjustment is done by means of cocks on the main pipe leading to the burner. The needle valve controls the oil and the cone valve controls the air supply; each being fitted with a locking ring, so when several burners are in use on a furnace, it is possible to lock the valve on each of them, and the same amount of fuel can be passed through each burner. This arrangement conduces to the greatest economy in the consumption of fuel.

The flame does not impinge directly on the crucible, but has a rotary action and circulates around it, this ar-

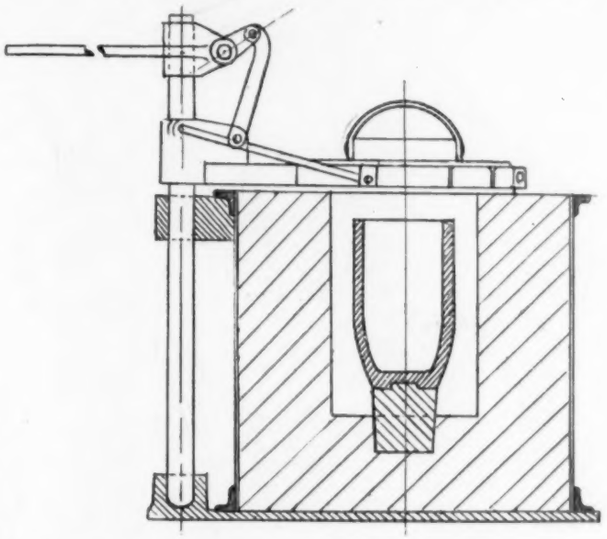


FIG. 8. SECTIONAL VIEW OF FURNACE SHOWN IN FIG. 7.

rangement saving the sides of the crucible from the scouring action which takes place when the flame directly impinges on them. The furnace can be either supplied for working with high pressure blast or low pressure fan blast. The average oil consumption being when melting brass about 2 gallons per 100 pounds of metal melted, but of course they can be used for melting other metals such as nickel, etc.

Another type of melting furnaces for the continuous melting of tin, lead, zinc, aluminum and similar metals, and also for reducing jewelers' sweep, etc., is made by Messrs. Fletcher Russell and Company, Ltd., and shown in Fig. 9. This type of furnace has the advantage of the tilting type furnace as the crucible is not taken out to pour the metal and at the same time the furnace is not tilted when pouring, hence the crucible is not firmly wedged in, but the heat can pass completely around it. The crucible consists of a cylindrical steel body resting on an iron stand with three legs. The top is covered in and is fitted with a large hopper, in which the metal is placed to feed the crucible. The body is lined inside with firebricks and a discharge pipe of salamander or fireclay is fitted and passes from the crucible through the body of furnace at an angle and distance from the floor suitable for the ladle.

DOUBLE CRUCIBLE FURNACES.

This type of furnace, as its name denotes, contains two crucibles, and the hot heat after passing round one crucible is led to the other one. The idea has been for increased economy, by utilizing the waste heat from one

furnace to heat up the other, instead of passing direct to the air. To show the saving effected, if copper is being melted in one crucible and brass in the other, then by the time the copper is melted in the one, the waste heat is sufficient to melt the brass in the other one, or if the same kind of metal is desired in both crucibles, then by the time the metal in the one is melted, the metal in the other has reached a temperature above half its melting point. The furnaces are practically two single furnaces connected together with a flue or pipe, to conduct the heat from one to the other, and if desired, at any time, either furnace can be used independently. There are two burners, one

FIG. 9. CONTINUOUS WHITE METAL MELTING FURNACE. FLETCHER RUSSELL & COMPANY.

under each crucible, with separate fuel supply pipes, cocks etc., but only one is lighted at a time. When the metal in one crucible is melted, then the burner is turned out and the other one lighted, so that the metal which is already at a temperature above half the melting point, is soon ready for pouring. Meanwhile the first crucible that has been poured and filled again, is now receiving the waste heat from the second crucible. It will easily be seen that there is practically a continuous supply of metal, as by the time one crucible is ready for pouring the other one is practically so, and it only requires a few minutes of lighting the burner beneath it to be ready for pouring.

Fig. 10 shows one of this type of furnace by Messrs. Fletcher Russell and Company, Ltd., and is called the "Double Cyclone" crucible furnace. The construction will be clearly seen by the illustration, as it practically consists of two ordinary furnaces mounted on one stand, but joined together by means of a pipe for conducting the waste heat from one to the other. Each crucible has its own burner, but of course only one is lighted at a time. The furnace is fitted with a removable base for cleaning purposes, and the design has been studied throughout, so as to give no more trouble than a single furnace. They are made in three sizes, the largest melting about 160 pounds of metal.

Fig. 11 shows a similar type furnace by Messrs. Allday and Onions, Ltd., which is intended for using oil as a fuel. The furnace is made in 8 sizes, ranging from 50 pounds of metal melted, with approximately average oil consumption of 1 gallon per 50 pounds of metal, but after

FIG. 10. "DOUBLE CYCLONE." FLETCHER RUSSELL & COMPANY.

the first heat this is considerably reduced. Time for melting gunmetal, after first heat, being about sixteen minutes. The largest size of furnace, melting 500 pounds of metal, uses 5 gallons of oil per melt, and the time to bring the metal down is about 50 minutes.

ROLLING METAL MELTING FURNACES.

Fig. 12 illustrates an improved type of rolling furnace made by Messrs. Allday and Onions, Ltd., and fitted with their patent oil burner. The great economy effected

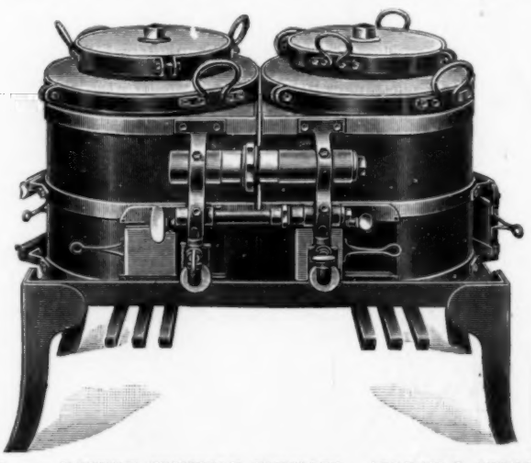


FIG. 11. DOUBLE CRUCIBLE FURNACE. ALLDAY & ONIONS.

by this furnace is proved by the number of large aluminum and brass founders who are using them. The makers claim that it is less expensive in operation than any other type, there being no crucible required and the heat comes in direct contact with the metal. The body of the furnace is constructed of heavy steel plates and the ends are formed with cast iron plates. It is mounted on cast iron standards having split bearings, so that the body of the furnace can be picked up by a crane when desired, and enabling the metal to be poured direct into the mold; this is a distinct advantage in many foun-

dries. The body is lined with the best quality firebrick, which will last for a considerable time, and when worn out are easily replaced. The furnace is fitted with a movable plate fixed round the pouring holes, so that the pouring brick which suffers the greatest wear can readily be replaced without interfering with the rest of the lining.

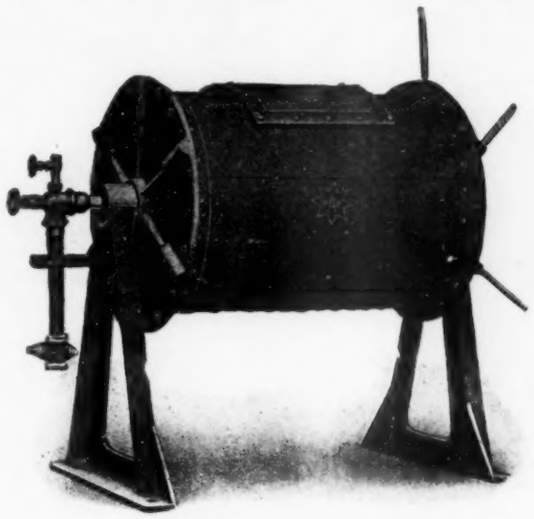


FIG. 12. ROLLING METAL MELTING FURNACE. ALLDAY & ONIONS.

The air pressure for the burner varies from 10" w. g. to 21 pounds per square inch, 56" w. g. according to the metal to be melted, is recommended. The patent oil burned is a special feature, as in it atomization of the oil takes place and consequently more perfect combustion takes place than is possible with most burners. Almost any kind of oil can be used, creosote, crude oil, petroleum, etc. The consumption of oil is approximately 2 gallons to melt 100 pounds of brass, but a great deal, of course, depends on the quality of oil used. Turnings and borings use more than the ordinary scrap.

The furnace is made in four sizes, No. 1 having a capacity of 100 pounds of brass, or 30 pounds of aluminum; the brass being melted in about 30 minutes. No. 4 furnace, having a capacity of 1420 pounds of brass or 430 pounds of aluminum, the time to bring the brass down being about 90 minutes. When aluminum only is to be melted then a thinner lining may be used, thus giving a much larger capacity to the furnace; for example, No. 3 size will hold 300 pounds of aluminum if the thin lining be used, but with the ordinary one for brass and aluminum, then it will only hold 150 pounds. This is an important point for aluminum founders, as the capacity is doubled.

Any mixture may be melted successfully, but care must be taken that the furnace is cleaned out; this, however, is very easily done. The oil tank may be placed in any convenient position either in the building or outside, but it should be placed 8 to 10 feet, at least, above the floor.

TILTING TYPE FURNACE.

The advantages and disadvantages of the tilting type furnace have been briefly discussed in the opening portion of this article, consequently the writer does not wish to recapitulate them, but will proceed to give a description of two leading makes.

Fig. 13 gives a general outside view of the M. R. V. furnace, which is made by the M. R. V. Furnace Company, 37 Imperial Buildings, Dale End, Birmingham, who claim that this furnace has several advantages over the ordinary pit type furnace, as one furnace can supply seven or eight molders with molten metal, with greatly reduced fuel consumption; the loss of metal is reduced to a minimum, as the charge is brought down in considerably less time than in any other method, and there is no metal wasted or lost in the ashes; the furnace being above ground can be cleaned, overhauled and restarted in the least possible time. The furnace has been on the market upward of 3 years and has been supplied to most of the leading foundries, and the makers find that some of their customers average 50 to 54 heats, others from 60 to 85 heats per 440 pounds capacity pot, and 40 to 45 heats per 150 or 250 pounds capacity pot. The number of heats from one plumbago pot varies according to the metal melted, as the better the

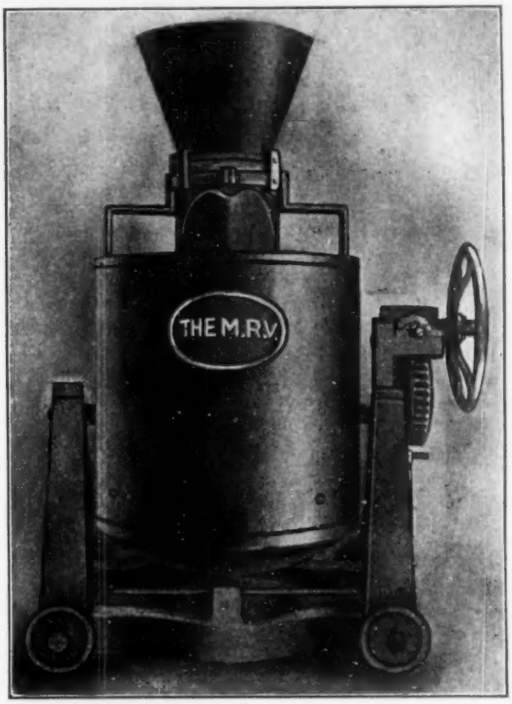


FIG. 13. M. R. V. FURNACE. M. R. V. FURNACE CO., BIRMINGHAM. Manufactured in the United States by J. B. Wise, Watertown, N. Y.

metal the longer the life of the pot. The makers guarantee that one man working one furnace will melt in one working day—7 heats of metal (either copper gunmetal, or yellow brass) capacity 400 to 440 pounds per heat; and to use no more than an average of 56 pounds of coke (hard) per heat; or 8 heats per day, 250 pounds capacity, and to use no more than an average of 45 pounds of coke per heat; or 8 or 9 heats per day of 150 pounds capacity, and to use no more heat than an average of 35 pounds of coke per heat.

The furnace consists, as will be seen, of a cylindrical vessel mounted on a wheeled carriage. Within the outer shell there is a second steel cylinder with an annular space between the two. The inner cylinder is lined with firebricks and constitutes the furnace proper. The crucible in which the metal is to be melted is placed in this furnace, the annulus between the crucible and the fire brick lining containing the coke. Air for combustion is admitted at the top of the annular space between the outer casing and the brick lined cylinder, and in circulating downwards it becomes heated, while the outer casing is kept cool. At the bottom is a circular tuyere plate, so constructed that the blast of air does not strike directly on to the crucible. The bottom is also arranged so that the lining may be repaired without removing the

crucible. The whole furnace being turned bottom up on its trunnions for the purpose. The coke space is covered with a circle firebrick, and the products of combustion are directed upwards through what is known as a preheater. This is a cylindrical vessel of refractory material, having the appearance of a bottomless crucible, and is held by a hinged arm, by which it can be swung out of the way. When in use it is above the crucible and is filled with pieces of the metal and these therefore become heated and drop down into the crucible, to be more readily melted and by these means a certain amount of heat is saved. For the purpose of pouring the metal, the whole furnace is tilted on its trunnions, when the metal runs from the crucible out through the spout shown. The crucible comes level with the top plate of the furnace. The furnace is easily portable to any part of the foundry, and tram lines can be laid down, if necessary, to carry the furnace to the molds, so that all skimming and other operations can be carried on in a separate building where the melting takes place, so that the fumes are kept out of

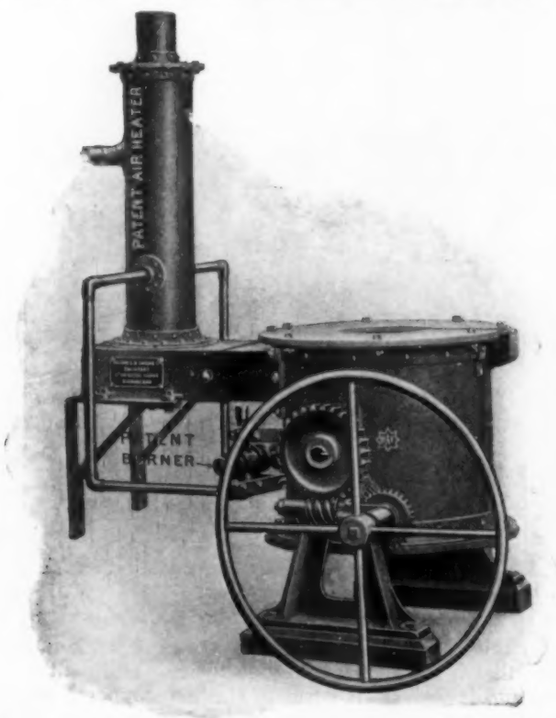


FIG. 14. ALLDAY & ONIONS' TILTING CRUCIBLE FURNACE.

the foundry excepting of course, during the actual time of pouring. An important point is that the metal is actually under observation of the operator during melting, while the advantage of keeping the metal hot until it is poured is apparent, the last cast being as hot as the first. The fact that the crucible is not taken out of the furnace makes this possible, while the crucible is not subjected to the sudden changes of temperature to cause violent expansion and contraction, naturally adds to its durability. We understand that a plumbago crucible will last seven or eight days, with six or seven heats per day. The lining will last twelve months, but requires patching once or twice a week. The furnace is made in five sizes, viz. to melt 250, 330, 440, 650 and 1,000 pounds of metal respectively.

Another make of tilting furnace is shown in Fig. 14 and Fig. 15, the former showing the furnace in its normal position and the latter in the position when pouring. This furnace is made by Messrs. Allday and Onions, Ltd., Birmingham, and is intended to use either oil, town or producer gas with their patent burners, which have given such good results on their other type furnaces. The body of the furnace containing the crucible is mounted on trunnions, as shown, and is actuated by means of a large hand wheel driving a worm and worm wheel through a pair of bevel wheels. The furnace is lined with the best quality firebricks, and the burners project the flames against the concave lining, causing the flames to take a spiral course around the crucible, thus avoiding the cutting action which is so detrimental to the lives of the crucibles. An interesting feature is the hot air blast apparatus (Allday's patent), by means of which the air is heated to a high degree, before it enters the furnace. The air from the blower is conducted to a receiver which surrounds the chimney pipe and after entering it near the top leaves it near the bottom, by which time it has practically attained the temperature of the gases in the chimney. Heating the air in this manner has been found to

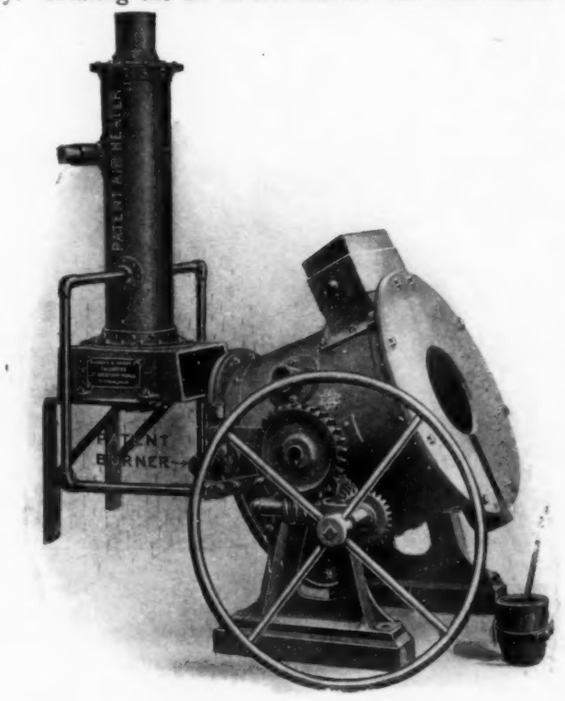


FIG. 15. ALLDAY & ONIONS' TILTING CRUCIBLE FURNACE IN ACTION.

be a great source of economy and greatly assists in bringing the metal down quickly with the minumum amount of fuel.

The furnace is made in all sizes up to 500 pounds capacity, and for use with gas or oil fuel as desired.

CONCLUSION.

The writer hopes that this short description of a few of the leading types of English-made furnaces will be sufficient to show that although, perhaps, American and Continental firms were the pioneers in this class of furnace, yet now the suitability and advantages have been proved in practice, there are English firms who have set themselves out to meet the demand that is sure to come; as with the competition and new regulations in force, firms must move with the times, and in the writer's opinion the pit type furnace is doomed. Most of the furnaces in this article have been in use for some time, so that their practicability and durability to meet the every day work of the ordinary metal foundry have been proved.

A RAPID, PRACTICAL METHOD FOR THE DETERMINATION OF ANTIMONY AND TIN IN ALLOYS SUCH AS BABBITTS AND SOLDERS.

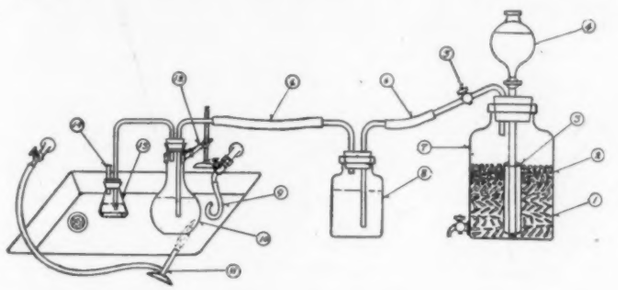
By W. B. Vietz.*

Genuine babbitts are nearly always hardened by means of copper and it is often desirable to have a quick method of estimating this copper as well as the antimony and tin in the babbitt. Solder into which copper "leads" of electrical coils are dipped takes up copper and it is essential when solder is so contaminated to be able to quickly estimate the amount of copper present as well as any antimony that may have been added to cheapen the solder or give it a better color.

W. B. VIETZ.

In order to test for and estimate closely the small percentage of copper that may be present in such alloys, the following method was devised. It is a modification of the W. H. Low method, published in the Journal of the American Chemical Society, of January, 1907, which consists essentially in titrating in the same solution, first the antimony by a standard potassium permanganate solution and then the tin by a standard iodine solution. The details of the modified method are as follows:

Take 0.3 to 0.5 gram of fine drillings in an ordinary wide mouth thin glass flask (a round bottom pint flask is suitable) and add 10 or 15 c.c. of concentrated sulphuric acid. Heat carefully over a bare flame until the alloy is all dissolved. It is convenient to use a wooden holder for the flask which is kept in constant motion while heating over a not too strong flame. Alloys with much tin dissolve readily while those with more lead and antimony require more boiling in the acid.



Item.	Description.
1.	Coarsely broken glass.
2.	Marble lumps.
3.	Glass tube.
4.	2 L funnel for HCl.
5.	Gas cut off.
6.	Rubber tubing.
7.	5 Liter bottle.
8.	Water wash bottle.
9.	Hose for cooling flask.
10.	50 c. c. flask solution of tin.
11.	Gas burner.
12.	Clamp support.
13.	Water indicator, to show when any suction starts in main flask.
14.	Steam escape.

*Assistant Chemist, Westinghouse Electric and Manufacturing Company.

COPPER DETERMINATION.

For the copper test let the sulphuric acid solution cool down somewhat and add 15 c. c. of distilled water and 15 c. c. of concentrated hydrochloric acid. Compare the color with that of a similar solution containing a known amount of copper. Approximately the same percentage may be put in a trial solder solution at the time by having a standard dilute solution of copper sulphate on hand. In making this color comparison it is essential, of course, to have all conditions the same as nearly as possible. The test is applicable up to 4 or 5 per cent. of copper and it will be found that even 0.2 or 0.3 per cent. of copper shows a distinct color in the hot and concentrated solution.

ANTIMONY DETERMINATION.

Having tested for copper, if necessary, dilute the solution to about 200 c. c. and cool thoroughly. Titrate with standard potassium permanganate for the antimony. The end point is a momentary pink coloration which is more fleeting and uncertain if too much hydrochloric acid is present. From 10 to 15 c. c. of hydrochloric acid is enough.

If the potassium permanganate solution is made 1/59 stronger than one-tenth normal or 3.21 grams of potassium permanganate to 1,000 c. c. of distilled water, then 1 c. c. of the standard solution will equal 6 milligrams of antimony. On a 0.3 gram sample, simply double the burette reading for the percentage of antimony. Standardize the solution by using Kahlbaum's C. P. antimony in order to determine the correction, if any.

TIN DETERMINATION.

After the permanganate titration add to the solution about one gram of the Kahlbaum C. P. antimony and 25 to 50 c. c. of concentrated hydrochloric acid, according to the amount of tin present. The antimony must be very finely ground in an agate mortar to be effective in reducing. Connect the flash with a carbon dioxide generating apparatus and heat the solution carefully by means of a moving flame and boil for two or three minutes (see cut for details of carbon dioxide apparatus).

Cool rapidly under the tap while passing a current of carbon dioxide into the flask to prevent the re-oxidation of the tin solution by the air and in order to counteract the back suction as the flask is cooled with the running water. As soon as cool add a little fresh starch solution and titrate rapidly by standard iodine solution, about one-tenth normal, until the liquid shows a blue-black color. Thirteen grams of iodine to 1,000 c. c. of distilled water is a convenient strength, as 1 c. c. equals approximately 6 milligrams of tin. Standardize against C. P. tin. Dissolve and treat in a similar way to that used in the analysis, as there is usually a small correction to be made depending on the various conditions.

The results are reliable only when the process is carefully carried out. The titration of both the tin and antimony requires a little practice or acquaintance in order to judge the end point accurately. For many alloys, especially solders, these three rapid determinations of copper, antimony and tin, will also allow the approximate

estimation of the lead in the alloy by difference. Where a great number of determinations are made it will be found a measure of economy after an analysis is finished to wash by decantation the antimony that is left. It can then be dried, re-ground and used again.

The impure tin oxide that is often obtained in gravimetric analysis of alloys, drosses, skimmings, ets., may be conveniently treated by the above method. In order to do this the calcined tin oxide is fused with equal amounts of sodium borate and sodium carbonate, the fusion dissolved in hydrochloric acid, then reduced with antimony and titrated with starch and iodine as before described.

THE APPLICATION OF FILES IN METAL SHOPS.

A Description of Their Manufacture and Some Reasons for Variation in Lasting Qualities.

By "Easy Way."

The file is the commonest and one of the oldest of the tools employed by the modern craftsman. Its simplicity and its apparent efficiency seem to have defied any attempt at radical improvement. The advent of the file cutting machine has indeed revolutionized the process of its manufacture; but even here the aim has been to imitate as closely as possible the hand made article, and the controversy still rages, at any rate, in the ancient seat of the industry between the advocates of the hand-cut and the machine cut.

The inequality between the two sides of the same file is one of the most remarkable facts, and it is of almost universal occurrence, being equally marked in hand-cut and machine-cut files. An average of all the files put to the test gives a mean ratio of four to one between the work done by the good sides and bad sides, respectively. This may be quite surprising to the majority of our laymen, but it is a positive fact. Careful investigation has, however, failed to detect any extraneous cause; files do not become sensibly heated during their work, so there can be no question of the temper being drawn; moreover, the better result is obtained as often as not from the second side tested, which would not be the case if any injury were done. Very often you will see even an apprentice boy mark the good side of a file and keep it for special occasions.

Several possible explanations suggest themselves. The difference might be due to accidental variations in the cutting process, the sharpness of the tool, etc. This would only account for the variation, supposing the tool to be so rapidly blunted as to require sharpening after each file, so that the second side was always cut with a blunter tool than the first. It might be due to some feature in the tempering process, causing one side to be harder than the other. Again, it is possible that in cutting the first side the blank becomes curved or buckled so as to present a somewhat springy resistance to the cutting tool when the second side is operated on. Or it might be due to the teeth of the first side cut being in contact with the bed or block, and so being injured in the cutting of the second side.

The question is one that can be answered by the file maker. I have no practical experience in file making, and can offer only the above tentative suggestion, though it will be shown later that there are some special considerations pointing to the explanation last suggested. The peculiar behavior of files is that they do not cut best when new, but better after being worked a considerable time.

Another striking feature is the abruptness with which the file ceases cutting. One might reasonably expect that a file would cut best when new, that it would begin to lose its sharpness almost from the first stroke, and afterwards deteriorate continuously and almost indefinitely. The fact remains that the file actually increases its efficiency during the first quarter of its life, and retains it almost unimpaired until it suddenly ceases to cut; but it would be possible to get more work out of it under an increased pressure per square inch, either by bearing more heavily on the same area, or by filing on a smaller surface with the same bearing pressure. It may be remarked in passing that these results, which are by no means exceptional, throw a somewhat lurid light on the present state of the ancient art of file making.

Consider the case of a bastard file having teeth pitched twenty-five to the inch, operating on a surface one inch square under a total pressure of thirty pounds, which is about what would be put on it in heavy filing by hand. The portion of the file which is in contact with the work at a given instant consists of twenty-five cutting or scraping edges placed one behind the other, each edge being one inch long. As a matter of fact, the edges are broken up into teeth by the light cross cuts, and this somewhat shortens their effective length. But ignoring this for the moment, the file is analogous to a broad cutting planer tool having an edge twenty-five inches wide and pressed against the work with a force of forty pounds, or rather more than one pound per inch of cutting.

In planing with a broad cutting tool it is a common experience that, unless the edge be extremely sharp, the tool will, under a moderate amount of pressure, simply slide over the surface of the work without cutting it. If the pressure is gradually increased by feeding down the tool box a point is eventually reached, when the tool suddenly penetrates the surface and probably takes off a considerable cut. The amount of pressure required to produce this result depends on the width and on the bluntness of the cutting edge, being less for a narrow or sharp tool and greater for a wide or blunt; in other words, it depends on the area of contact [width $\times$ thickness], of the cutting edge with the work, and there is a definite pressure per square inch of edge below which no rupture of the surface can take place.

The amount of this limiting pressure is, of course, affected by the hardness of the planed surface and also by its smoothness, both of which we here assume to be constant. In the case of a file regarded as a broad cutting tool, the available pressure is so small and the width of the cutting edge so great, that extreme sharpness is necessary in order that the limiting pressure per square inch of edge contact may be exceeded. When a new file is set to work the curling edges of the burrs which do duty as teeth come in contact with the work, and, as might be expected from their shapes, they do not give the best possible cutting effect. Being very thin and fragile, they are soon broken or worn away, leaving a more or less sharp cutting edge, and it is during this breaking off of the curled tips that the rate of cutting gradually increases to a maximum.

Some makers now use a sand blast for the purpose of taking off the curled tips of the teeth. This produces a file which starts work with its maximum sharpness, but at the expense of a certain portion of its life. The extreme delicacy of the actual cutting edges of the file suggests an explanation of the peculiarity that one side of the file is almost always more efficient than the other. When the file blank has been cut on one side, it is turned over and rested on the delicate burrs which have been raised, which are, of course, quite soft, and whose tips are so fine that they might be turned with the finger nail. It is scarcely possible that the violent hammering to which the file is subjected in cutting the second side should fail to injure these fine cutting points, even though the block on which they rest is no harder than lead. It is difficult to see how this injury can be avoided unless by coating the first side with some plastic substance. At any rate, this is a problem to which file makers should give their attention as the present method of manufacturing has the effect of reducing the possible working capacity of files by 50 per cent. on an average.

The main factors governing file efficiency are three, the quality of steel, the form of the teeth and the temper. As long as file contracts are decided as at present, mainly on the question of prices, so long will the business go to the makers using the cheapest steel that will harden. But once let value be substituted for prices as the ruling consideration, and it will at once become possible for makers to employ the high class steels, which have revolutionized engineering practice within the last few years. I merely claim here to have proved the existence and the importance of the variation. The cause must be sought by a detailed examination of the manufacturing process.

CUPRO-NICKEL STEEL*

AN INTERESTING REPORT OF EXPERIMENTS RELATING TO THE SUBSTITUTION OF COPPER FOR NICKEL IN HIGH STRENGTH STEELS.

BY G. H. CLAMER.†

A systematic study of the properties and constitution of a complete series of alloys presents a most interesting field of research. It has only been within the past comparatively few years that methods have been devised for the proper study of the constitution of alloys, and by means of which a better understanding of the properties is to be gained. Practically all the binary alloys have been studied up to the present time, at least of all of the more important metals, but the constitution of the ternary and quaternary combinations presents an almost endless field for research. The study of the combination of metals to form alloys is particularly interesting because the results obtained are often most surprising and least expected, and even with our present knowledge are unexplainable and quite the reverse of what might be predicted. A few examples of the surprising results due to the combination of metals to form alloys, are as follows:

1. Magnetic properties of certain alloys of manganese with aluminum. Two metals having no magnetic properties.

2. Extremely high melting point of certain alloys of antimony and aluminum. Two metals of comparatively low melting point.

3. Disintegration of certain alloys of iron and aluminum, nickel and aluminum and manganese and aluminum, which disintegrate after some months' standing and actually fall to powder.

4. The surprising ductility of certain ternary alloys, which result from the addition of two metals in combination with a third, in such proportion, that were either of them added separately in proportions in which they exist in ternary alloy, would make an alloy which is quite brittle. The alloy practically referred to was discovered by Sir Robert A. Hadfield and described by him in the Iron and Steel Institute, 1905. It is of the following composition:

Carbon	.6	per cent.
Manganese	5.04	"
Nickel	14.55	"

This steel having an ultimate strength of 60 tons and an elongation of 70 per cent.

One of the series of alloys which I am about to describe in this paper is an alloy of this nature. It has copper present in such proportion, that were it added alone to the steel, would render it exceedingly brittle, i. e., such a steel would have practically no elongation whatever, whereas, with the joint addition of nickel there results an alloy of high ductility. Before describing this alloy, it would probably be well to review the results of various investigations who have studied the binary alloys of iron and nickel and iron and copper, both with and without carbon. The iron-nickel alloys may apparently be divided in three classes,, i. e.:

1. Those containing less than 8 per cent. nickel which have a pearlitic structure.

2. Those containing from 8 to approximately 25 per cent. nickel which have a martensitic structure.

3. Those above 25 per cent. which have a crystalline structure.

These proportions, however, are not absolutely fixed, but are dependent to a great extent upon the carbon content, transitions taking place at lower percentages of nickel with higher percentages of carbon. Messrs. Chas. Burgess and James Aston, of the University of Wisconsin, recently investigated the complete series of nickel alloys with electrolytic iron of high purity, so that the effect of the alloying metal was due to nickel alone, and not to some combined influence which might result from the use of more impure material, by which they confirmed the existence of these three ranges in the constitution of nickel-iron alloys. The effect of the nickel on the iron, as they describe it, to be as follows:

1. To increase the strength with a slight decrease of ductility in the range of lower nickel content.

2. Beyond this range the addition of nickel causes a sudden increase of strength with a marked decrease of ductility over a zone of decided brittleness.

3. The position of the brittle zone varies with the carbon contents and probably with a variation in the other impurities, such as manganese, if present in appreciable amounts. For a pure alloy, where the effect is due to nickel alone, the area may be set between 10% and 16% of nickel. The addition of carbon places the zone at lower percentage of nickel, beginning in the neighborhood of about 10% for carbon = 0.22% and at about 7% nickel for carbon = 0.82%, where the other impurities are small. It may commence as low as 5% nickel in medium carbon steels (C=0.44%) where the manganese rises to 1%. Accompanying this brittleness, there is a marked hardening in the material.

* Paper read at Annual Meeting American Society for Testing Materials, Atlantic City, June 28 to July 2, 1910.

† Secretary Ajax Metal Company, Philadelphia, Pennsylvania.

4. Annealing, while not greatly affecting the region of the brittle zone or the extent of the brittleness, has a tendency to confine the range to more narrow limits.

5. For percentages of nickel above those of the zone of brittleness there is a restoration of the ductility and softness.

The iron-copper alloys have also been investigated quite thoroughly by a number of investigators, but with very conflicting results which were no doubt due to the influence of carbon in the alloys under investigation. It is formerly thought that iron and copper would not alloy, except in very small proportions of one with the other, but it has now been thoroughly demonstrated that the extent to which copper will alloy with iron is dependent entirely upon the carbon content. Carbonless iron and pure copper will alloy in all portions, and will not separate into two conjugate layers in the cast ingot. Stead has shown that the complete series of copper-iron alloys, according to their constitution, may be classed into three distinct series, i. e.:

1. Alloys with trace up to 2.73 per cent. iron, 97 per cent. copper.

2. Alloys between 2.73 per cent. iron, 97.2 per cent. copper and 92 per cent. iron asd 8 per cent. copper.

3. Alloys between 8 per cent. and trace of copper.

The first class is quite homogeneous, consisting of but one structural constituent. The second class consists of two structural constituents. The third class also has but one structural constituent, which, however, is made up of crystals which are richer in copper in the last portion to solidify.

The properties of these copper-iron alloys have also been recently investigated by Messrs. Burgess and Aston, and they have found that additions of copper up to 8 per cent. causes an increase in ultimate strength and diminution in ductility, and the alloy with 8 per cent. having no ductility whatever. As a result of this valuable research, they have recommended for commercial use, the alloy with 1½ per cent. copper, this alloy having very much the same properties as nickel-steel with 3½ per cent. nickel. Still it must be remembered that this alloy was made from practically carbonless iron, and, therefore, would no doubt present some practical difficulties in its manufacture.

I have reviewed these iron-nickel and iron-copper series of alloys, in order to show, as I have stated before, what surprising results are obtained by the joint addition of copper and nickel, i. e.: Alloys can be produced carrying from 5 to 20 per cent. copper, which without nickel would be extremely hard, brittle and red short, but these become, by the addition of nickel in the proportion of 20 to 50 per cent. highly ductile, easily forgeable and machinable. Such alloys are capable of being rolled into sheets or rods, and can be machined without difficulty, in fact they are quite soft.

The following are tests of two typical alloys within these ranges of proportions:

	No. 1.	No. 2.
Copper	9.00	19.50
Nickel	22.00	45.00
Carbon	.22	.2
Ultimate strength	101,000 pounds	98,230 pounds
Elastic limit	57,300 "	54,160 "
Elongation	42.5%	35%
Reduction of area	61.5%	47.9%

These tests were made on rolled rods. The elastic limit, it will be noted, is quite low in proportion to the ultimate strength, which naturally accounts for thin softness. Alloys at the lower range of the series can be bent cold to an angle of 180 degrees without fracture, whereas those at the higher end of the series cannot be bent so far. Alloys at the lower end of the series will resist corrosion in a highly satisfactory manner, and those at the upper end are practically non-rusting. Samples which have been exposed for the past year in contact with concentrated foundry gases, and here at Atlantic City in contact with salt atmosphere, have demonstrated these facts. In addition to this, the alloys have a very low co-efficient of expansion. Just what these alloys might be used for has not yet been determined, but no doubt quite a number of uses will suggest themselves, i. e.: as a substitute for the present 25 to 35 per cent. nickel-steel, and probably quite a number of others, because the steel can be produced at a very much lower cost, not only because of the substitution of copper for nickel (copper selling at the present time at less than one-third the price of nickel), but because the alloy can be made from Monel metal, a commercial alloy of copper and nickel, containing the copper and nickel in correct proportions for making such a steel. Monel metal sells for about the price of copper. It is also possible to make the steel directly from Sudbury nickel ores, by simply smelting and "Bessemerizing" to eliminate the iron to the extent desired, roasting the matte produced, and finally reducing the combined oxides resulting from roasting of the matte. It is thought that either by the use of Monel metal for making the steel alloy, or by the direct production of it from the ore, that the cost of production might be sufficiently reduced to make it attractive for roofing, gutters, spouts, ventilators and many other uses where its resistance to corrosion and its low co-efficient of expansion will warrant the cost. Such sheets can be produced to sell at a very much lower price than copper, and probably two to four times the price of commercial coated iron and steel sheets, but as the alloy is about twice as strong as the soft steel and three times as strong as copper, thinner gauges can be used. The alloys at the higher end of the series, as I have said before are non-rusting.

Steels within this range of proportions of copper and nickel have a crystalline structure, such as is possessed by nickel-steels carrying above approximately 25 per cent. nickel or with somewhat lower percentage of nickel, if carbon is present in appreciable amount. In other words nickel-steel within the crystalline range, the copper apparently acting very much like nickel. It will be noted that the physical properties are very similar to those of the same nickel-steels without copper.

Noting the curious and unexpected results obtained with these high copper-nickel alloys, I became curious to know what would be the effect of replacing part of the nickel in nickel-steel within the pearlitic range by copper, and accordingly made such steels with from 1 to 8 per cent. Monel metal in which the proportion of nickel to copper is roughly 2½ per cent. nickel to 1 per cent. copper. Here again the copper really acts like so much nickel, at least when present in these relative proportions, and it is possible, therefore, to produce a steel of practically the same physical properties as nickel-steel, at very much reduced cost. In these steels the nickel, iron and copper are in the same relative proportions in which they exist in some of the prominent mines in Sudbury, where vast deposits exist, average analysis of these ores being as follows:

Copper	.8 to 2	per cent.
Nickel	.2 " 5	"
Iron	35.0 " 52	"
Sulphur Sangue	Balance	

It will be seen by the operation of reducing this ore to matte, calcining the matte to remove the sulphur and reducing the calcined product that this steel can be produced almost to the desired formula. The valuable properties of the nickel-steel, i. e.: carrying below 6 per cent. metal have, of course, long been recognized and recently the value of copper as a valuable constituent of steel, instead of a metal to be looked upon as a detrimental impurity, has also become recognized. It is probably not quite so surprising, therefore, that the joint addition of copper and nickel within this range of proportions is productive of valuable results. The addition of these two metals in combination seem to have the same effect upon the steel as if they were individually added, the copper in its effect really being about the same as so much added nickel. It is possible, therefore, to replace part of the nickel, in nickel-steel by copper, without materially altering the physical properties. The following table gives the physical properties of some of these alloys:

	Monel Metal.	Carbon.	(Lbs.) Ultimate Strength.	Elastic Limit.	Elongation.	Reduction in Area.
No. 1....	4	.11	83,600	66,300	26.5	65.4
" 2....	3	.10	75,300	64,600	25.5	71.4
" 3....	2	.15	75,500	63,700	28.	65.4
" 4....	4	.61	151,000	120,000	8.	15.8

Recently Messrs. Burgess and Aston, working quite independently of me, have confirmed these results with alloys which they have made with electrolytic iron, which has been quite gratifying, and although I have not had an opportunity to study all the properties of the complete series of alloys within these ranges, i. e.: pearlitic and crystalline, nevertheless, it would seem from the tests of the alloys, so far made, that these alloys may become of commercial value, especially as we now have at hand a comparitively cheap alloy from which they can be produced, i. e.: "Monel metal" and the further possibility of producing them directly from Sudbury ores.

TABLEWARE IN PALESTINE

MODERN USE OF SILVER-PLATED GOODS—CHEAP CUTLERY.

United States Consul Thomas R. Wallace writes from Jerusalem an interesting account of the use of tableware in Palestine, and of the manufacture of cutlery at Nazareth:

Among the peasantry, which by far form the largest part of the population of Palestine, tableware, such as forks and knives, are entirely, and spoons almost entirely, unknown. Their cooked food is eaten out of a large wooden bowl, around which the family or guests gather, seated on the ground. The thumb and first two fingers are used to eat with. Meat is never cut, but is pulled apart with the fingers. The old Bible custom of washing the hands before and after a meal is still universally kept up.

Among the better-off class of peasantry, especially the Christians, a few wooden spoons may be found in each home, while among the poorer ones there is seldom found anything in this line except a large wooden spoon for cooking purposes.

The city people, both Christians and Mohammedans, have until quite recently used wooden spoons entirely for eating their meals. These spoons are made of fine-grained woods, and are about the size, or a trifle larger, than a dessert spoon. They are imported from Damascus, Armenia, and other parts of Turkey. For a few years the cheaper sorts as well as the better qualities of metal forks and spoons have been steadily taking the place of the wooden ones, although as a rule the Mohammedan families of the poorer classes still use the wooden spoons almost entirely.

NATIVE CUSTOM—PRICES OF PLATED SILVERWARE.

The native city families have a custom of passing jelly to guests, when small solid silver spoons are used by the better-to-do and base metal ones by the poorer families, with which to serve the jelly.

Among the poorer classes of Jews in Jerusalem, who form about two-thirds of the population, metal tableware is used entirely. Silver-plated ware has always been used by the well-to-do foreigners, missionaries, etc., and the demand for it among the higher-class natives is steadily growing, and all of them, both Christian and Mohammedan, are adopting the European way of eating at a table, and many of this class use silver-plated ware partially and others entirely. There are five leading Jerusalem dealers in this line of goods. They import mostly from France, Germany, and Austria.

Silver-plated teaspoons retail for about $2.40 to $4.20 per dozen, and are generally of the plain patterns. So far none of this class of goods has been imported for the trade from the United States. Dealers have expressed their high estimation of American ware in this line, and have found the prices reasonable, but the matter of freight and the delay in getting the goods have entirely prevented them from ordering. These goods brought from Europe can be sent by parcels post, and they reach here four weeks from the time the order is sent, and the cost of carriage is very small.

NAZARETH CUTLERY MAKING—FOREIGN PURCHASES.

Nazareth is the only place in this mutaserrifiet where cutlery is made to any extent. In Damascus and in the Druse villages on Mount Hermon and in the Hauran this class of goods is manufactured quite extensively. The largest output of the Nazareth cutlery shops is in the form of a one-bladed jackknife. The handle is made of goat horn and keeps its natural curve, which the blade is made to fit. Each knife is provided with a ring, by which it can be secured to a chain. While these knives are quite crude, they are very serviceable, and nearly every peasant boy and man carries one. They sell for 1¼ to 3¼ cents each.

Daggers also are largely made. The most common form is with a curved two-edged blade, with a brass handle. The front of the sheath is made of sheet brass, ornamented, and the back of tin. The prices of these are also proportionately low. Razors are made which sell for 5 to 10 cents each. They are used by the peasantry, who keep ther heads shaved clean.

The Armenian pilgrims bring into this country for sale their native cutlery in the form of kitchen and jackknives. The latter is as above described. They get a little higher price for their goods, as they are somewhat better finished than those made in the native shops.

The bulk of the cutlery sold in the local city markets, such as scissors, table, kitchen, jack, and penknives, is imported from Europe. The Solingen trade-marks are the ones which are now most commonly found, and which to a large extent seem to be taking the place of the Sheffield wares.

PRODUCTION AND USES OF TUNGSTEN.

One of the most widely known of the rarer metals is tungsten. The production of this metal in the United States, however, is not large, as a little of it goes a long way for some of its most important uses. As by far the largest part of the tungsten produced is used in making tool steel, the demand for tungsten decreased greatly during the recent depression in the steel industry. In 1908 the domestic production of tungsten ore, reduced to an equivalent of ore carrying commercial basis in the United States, was 671 short tons, valued at $229,955, as against 1,640 tons, valued at $890,048, in 1907. The statistics at present available 60 per cent of tungstic trioxide (WO_3), the ordinary from foreign countries show a similar decline. These figures are taken from a report by F. L. Hess, of the United States Geological Survey, published in an advance chapter from "Mineral resources of the United States, calendar year 1908."

OCCURRENCE OF TUNGSTEN.

Tungsten is of wide occurrence, but the individual deposits can hardly be said to be large. As a rule they are "pockety"—that is, they occur in lenticular masses or small shoots. Many of those at the surface are quickly and easily mined, but it may then take all the profits derived from the first ore body to locate another one.

The tungsten minerals used as ores are hübnerite, a tungstate of manganese; wolframite, a tungstate of manganese and iron; ferberite, a tungstate of iron; and scheelite, a tungstate of calcium. They generally occur in veins cutting igneous rocks that contain much silica, such as granite and granodiorite.

USES OF TUNGSTEN.

The most important use of tungsten is as an alloy for tool steel, to which it imparts the property of holding temper at a much higher temperature than high-carbon steels. When lathe tools are made of tungsten steel the lathe may be speeded up until the chips leaving the tool are so hot that they turn blue. It is said that about five times as much work can be done by a lathe built for such speeds and work and fitted with tungsten-steel tools as can be done by the same lathe with carbon-steel tools. From 16 to 20 per cent. of tungsten is ordinarily used in lathe tools.

There has been a widespread belief that most of the tungsten mined went into armor plate, but is is stated by the Ordinance Bureau of the Navy Department that tungsten is not now and, so far as known to that bureau, never has been used in the manufacture of armor plate in this conutry, and it is not known to have been so used in other countries, though it has probably been used in experimental armor plates. One of the most essential properties of armor plate is its ability to resist shock, and this property is not imparted to steel by tungsten.

As the melting point of tungsten is very high—about 3,080 degs. C.—the metal is valuable for use as a filament in incandescent electric lamps, and such lamps are rapidly coming into common use. The whiteness of the light given by the tungsten filament makes it much superior to that of carbon and the efficiency of the tungsten lamp is more than twice as great as that of the carbon lamp. Thousands of filaments can be made from a pound of tungsten.

Tungsten salts are used in fireproofing cloth for curtains, draperies, etc.; in weighting silks; in glass making; as a mordant in dyeing; and for other purposes.

A copy of Mr. Hess's report may be had by applying to the Director, U. S. Geological Survey, Washington, D. C.

THE COLORING OF BRONZES.

The beautiful dark brown coloring which makes French bronzes and other metal ornaments so attractive is difficult to imitate, probably because the secret of the process has been so jealously kept by our French competitors. We do not know in how far the French process is known to the metal trade of this country, but believe it is only a favored few who are in the know. The browning of bronzes has often been attempted by the, "Liver of Sulphur" process. This however, never produces the superior dark brown with a reddish tinge known in France as Barbediéne brown. The process is quite simple when you know it, and we give below an exact description of it for the benefit of our readers.

The browning may be applied to all metals, but steel, iron, zinc and softer metals must first receive a substantial covering of brass, bronze or copper. Brass is preferable, as if this metal is so used as a basis the brown color will look best. It should be borne in mind that this browning process is in reality a chemical reaction, and that if the brass deposit on other metals is too thin it may be eaten through and the original metal may show through.

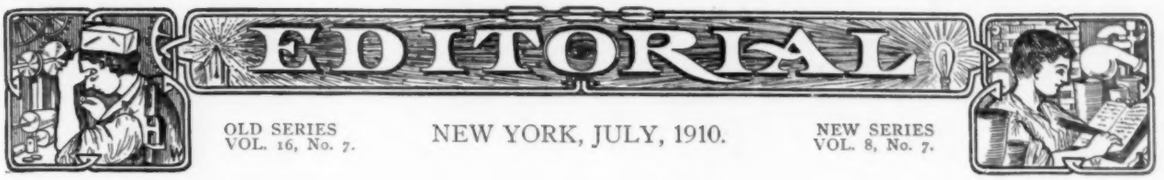
The ingredients used are finely powdered red sulphuret of antimony and liquid ammonia. They are mixed to the consistency of thin paint, and the article to be browned is then dipped into this liquid, or it is painted on with a soft hair brush. There is also a black sulphuret of antimony, but that must not be used for this purpose. The ammonia is the ordinary commercial quality and need not be excessively strong. The articles to be treated must be perfectly clean and with a bright metallic surface. The process is complete as soon as the coating is dry and after the red powder of sulphuret of antimony has been removed with a bristle brush. Should the red sulphuret of antimony be unobtainable, which is however, very unlikely, we may mention that it is the precipitate obtained from a solution of antimony salt, such as chloride of antimony or tartar emetic, treated with sulphuretted hydrogen.

INDUSTRIAL ACCIDENT COMPENSATION IN SPAIN.

Concerning the Spanish accident labor law which has been in operation ten years, United States Consul-General Frank D. Hill, of Barcelona, says it appears satisfactory and is considered an advance over the former system. For temporary incapacity the employer must pay the workman one-half the usual wage, or two years' salary if the incapacity is permanent, also being liable for drugs and medicines. In 1908 there were 36,976 accidents, involving the payment of $357,260 (including sickness), while in the first half of 1909 there were 15,607 accidents with $158,022 in payments. Payment of indemnities is attended with very little litigation.

SUDDEN RISE IN PRICE OF GLYCERIN.

United States Consul Horace Lee Washington, of Liverpool, advises that the price of glycerin has been steadily advancing owing, it is stated, to the formation of a combine of British glycerin makers. Chemists and other retailers a month or two ago were paying $27.25 per cwt. (112 lbs.) for glycerin, whereas a short time ago the price of this commodity was only $11.45.



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CONTENTS

AMERICAN SOCIETY FOR TESTING MATERIALS

ITS RELATION TO THE METAL INDUSTRY.

The recent annual meeting of the American Society for Testing Materials, which is affiliated with the International Association for Testing Materials, held at Atlantic City, N. J., June 28 to July 2, 1910, bears witness to the wide scope of the field to which the work of the society is devoted. There is hardly any material used today either in the arts or in actual constructive development that this society is not interested in. One has but to glance over the list of papers presented at this meeting to become impressed with the wide range of the field covered. The subjects treated range all the way from steel to sand and mortar and from copper to paint. One of these papers, that on Cupro-Nickel Steel by G. H. Clamer, is published in this issue of THE METAL INDUSTRY.

Of course, the society being comparatively young its first attention has been given to what may be considered the fundamental structural materials, such as iron, steel, cement, etc. The work of the society in this direction has been monumental and the standards of specifications and tests recommended by it and adopted by commercial and industrial concerns as well as governments will stand for all time. As the membership of the society has grown its facilities and abilities for increasing its scope have advanced in keeping, and it now finds itself in a position to turn its attention to the metals other than steel. To this end a committee has been appointed to be known as B2. This committee has been charged with the work of standardizing specifications and tests for the non-ferrous metals.

The B2 committee is divided into four sub-committees as follows:

1.—Pure metals in ingot form.
2.—Wrought metals and alloys.
3.—Sand cast metals and alloys.
4.—White metals, tin, lead or zinc base.

The work of these sub-committees will probably extend over several years and when finished will undoubtedly be as valuable to the world and reflect as great credit to the society as the work of the committees that are already veterans. As it is only within the last few years that the non-ferrous metals have been receiving the attention of scientific men in the matter of reconciling theory to practice, there are unlimited opportunities for investigation along the lines that the Society for Testing Materials proposes to work upon and the world at large cannot fail to be greatly benefited by the result of the society's labors. The annual meeting just concluded furnishes an excellent

idea of the enthusiasm with which this society pursues its prescribed course. With an attendance of over 300 the interest continued unabated until the last sessions. The meetings were well attended and enthusiastic discussions followed the readings of the papers.

One of the most important events of the meeting was the election as president of Dr. Henry M. Howe to fill the vacancy caused by the death of Dr. Charles B. Dudley, last December. The society certainly is to be congratulated in securing for its chief officer such a representative and able man as Dr. Howe, known all over the world, not only as an iron and steel expert, but also as a man of many parts. He cannot fail to reflect great prestige to the association. Another important result of the Atlantic City meeting was the raising of the dues from $5 to $10 per year. This, with the present membership of 1,200 odd members, will give the society double the income and put it on a sound financial basis. With this added income the society will be able to carry on its work with increased vigor and also to supply its members with bound copies of its transactions, which in the case of the coming year will be a volume of over 400 pages.

The choice of time and place for this meeting was a most happy one and this opinion is verified by the entire success of the meeting in point of interest and attendance. The American Society for Testing Materials has set an example that it would be well for other associations to follow in that it afforded its members and guests an opportunity to witness the holiday season at a great resort and also to pass a safe and sane Fourth of July at the seashore, where the noise of the firecracker was replaced by the "swash" of the waves.

WE CORDIALLY INVITE READERS' OPINIONS AND CRITICISMS OF ARTICLES PUBLISHED IN THE METAL INDUSTRY. SUGGESTIONS WELCOME.

THE MANAGEMENT OF PLATING AND POLISHING DEPARTMENTS.*

To the Editor of THE METAL INDUSTRY:

In reply to J. E. Pflueger's letter,* dealing with the management of the plating and polishing departments and arriving at the possible cost of the same, it gives me great pleasure to describe how to manage a staff of 50 polishers and finishers, 10 "wirers up," and two assistant platers dealing with between 60,000 and 80,000 instrument parts each week successfully. The polishing room is divided into six sections. No. 1 section consisting of 6 men. This gang is kept entirely for emery bobbing. No. 2 gang of 8 men for sanding. No. 3 gang of sixteen men for mopping. No. 4 gang of 8 men for finishing (after work has been plated). No. 5 and 6 gangs consist of eight youths for all small parts and the remaining 4 youths are for finishing small parts. By keeping these gangs together and classifying their work you are helping them to become proficient in producing first-class work. It is essential to keep each operation in order.

To arrange the shop, commence with the emery bobbers, partition them off with a glass screen, then follow in regular order, the "sanders," the "moppers," the youths' gang for mopping small parts, the finishing gang of small parts and finally the "finishers."

It is advisable to see that every operator finishes the part or parts of articles entirely himself. No hand in hand working should be allowed, because it is difficult to trace a bad piece of work. Always see that there is enough work in hand ahead of the bobbers, sanders and moppers, so that the plating shop can deal with the work to insure the finishers a constant supply. This will also guarantee a regular output each week. Instruct each gang as to the standard of the finish required, and as their chief it is the duty of the foreman to see that it is done.

If a gang cannot produce the finish required, then the foreman's abilities are requisitioned in helping the gang to obtain that finish. The management in the vat room is somewhat similar, the best results can be obtained in the following manner. After the work has come into the plating room, from the polishing room it is taken to the farthest part of the room where tables are arranged for wiring up. Each vat has one table to it and it is distinguished by having corresponding number of plates attached. No. 1 table with work wired up for No. 1 vat. No. 2 table with work wired up for No. 2 vat and so on. By doing this there is no risk of having work mixed, and it is very easy to trace the vat that is not giving the best results. The wirers, hangers in and dryers out should be thoroughly impressed with the necessity of carefulness in handling the work, so as to avoid all scratches which may possibly take place with the wire through careless handling, especially so where the articles are large in surface.

A method of arriving at the cost of polishing and plating rooms by which it can be seen at a glance what the articles done in these departments are costing, is the following. Take first the polishing room. The cost of all the materials used and the wages paid in this department must first be determined, also the number of articles done in this department (this should not be difficult), say for a period of one month.

As an example, say 250,000 articles are polished in the month. Supposing

Labor on these articles is.....	£12	10s.	0d.	($62.50)
Materials used	4	2	8	($20.66)
Total	£16	12s.	8d.	($83.16)

Therefore, bare labor and material of 250,000 articles is £16 12s. 8d. ($83.16) polishing only.

Then take the plating room. The cost of material and labor, also the number of articles done must be first determined for 1 month, for simplicity we'll say that the same 250,000 articles polished are also plated. Supposing

Labor on these articles is.....	£6	6s.	0d.	($31.50)
Materials used	3	1	8	($15.41)
Total	£9	7s.	8d.	($46.91)

Therefore, bare labor and material for plating 250,000 articles is £9 7s. 8d. ($46.91).

Now we have arrived at the bare cost, but you cannot base your final costs on this until you have arranged for such cost as those given below.

Rents, rates and taxes of premises.
Maintenance of building.
Wear and tear of machinery.
Lighting and heating.
Power.

MANAGEMENT CHARGES, ETC.

All these must be carefully considered and accurately worked out. No doubt the best way to arrive at this is to take one year's total of the different amounts of expenditure.

*THE METAL INDUSTRY, January, 1910, page 34.

Say that for one year this costs £112 16*s.* ($664). Divide this by twelve and you get the cost for one month, viz. one month establishment charges, £9 8*s.* ($47). We will now suppose that you are charging 4*s.* ($1) per 1,000 for articles done.

By the following table you can see exactly how much profit is being made.

Number of articles done, 250,000. Labor—Polishing room, £12 12*s.* ($63); plating room, £6 6*s.* ($31.50); total, £18 18*s.* ($94.50). Material—Polishing room, £4 2*s.* 8*d.* ($20.66); plating room, £3 1*s.* 8*d.* ($15.41); total, £7 4*s.* 4*d.* ($36.07). Charges—Plating room, £9 8*s.* ($47); total, £9 8*s.* ($47). Grand total, £35 10*s.* 4*d.* ($177.57).

250,000 articles cost.....	£35	10*s.*	4*d.*=($177.57)
Cost of 1,000 articles is.....	2	10	=($ .70)
Price charged per 1,000 is....	4	0	=($ 1.00)
Price per 1,000.....		1*s.*	2*d.*=(30)

ARTHUR J. BONE, Plater and Polisher.

Nottingham, England.

AUTOMATIC PLATING MACHINE.

To the Editor of THE METAL INDUSTRY:

In the June issue of THE METAL INDUSTRY, under the head of "Criticism and Comment," you published a letter signed Russell & Erwin Mfg. Co., but failed to append the author's name. Reading between the lines I should say it was not official. If an elective officer of the company will make comment over his signature, I shall be more than pleased to make reply to same.

CHAS. J. CALEY.

Peterborough, Canada, July 7, 1910.

APPRECIATION.

TO THE EDITOR OF THE METAL INDUSTRY:

Don't let my subscription run out. Notify me when it expires and I will renew. I look for your paper every month as I do my breakfast every morning. JOHN H. PARKER.

Philadelphia, June 24, 1910.

Shop Problems

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE OF THE METAL INDUSTRY. ADDRESS THE METAL INDUSTRY.

ALLOYING

Q.—We would appreciate your opinion as to the best method of alloying pure aluminum with copper to make the so-called No. 12 aluminum alloy, if the two metals are melted in separate receptacles and the copper at pouring heat is poured into the aluminum and properly stirred, will the aluminum take up the copper equally in all parts of the mass? We want the best method of doing this in quantitites, say of 500 to 700 pounds of aluminum.

A.—There is at present considerable diversity of opinion as to the proper method of alloying aluminum with copper. Some prefer in making such an alloy as No. 12, which contains 7 per cent. of copper, to proceed as follows: First melt the aluminum and then introduce the copper in small cut up pieces of sheet or wire. Then it will be assimilated, so to speak, by the aluminum and thus cause a more or less mechanical mixture, but there is no doubt but that the strength of the aluminum is very much increased. This is the best and simplest method for introducing small quantities of copper in a large amount of aluminum.

The chemical affinity of the aluminum for copper is quite marked and it will absorb up to a certain amount, say possibly 3 per cent., with considerable evolution of heat, thus raising the temperature of the mixture considerably above the melting point of aluminum and sufficient for the copper to be absorbed, so you see you would have as a resulting mixture a more or less perfect alloy of copper and aluminum mixture with a mechanical mixture containing the excess of copper over that required for the chemical alloy.

Another method pursued which, perhaps, is more expensive and more trouble is to first make a mixture of 50 copper and 50 aluminum, casting this into ingots and then using any sufficient quantity to introduce the required amount of copper in the new alloy. One of the attendant disadvantages of this method is that by first melting your copper you will have to use a temperature high above the melting point of aluminum that considerable dross is carried in melting the mixture and unless extreme care is exercised in fluxing and skimming, the result is the ingot will contain a considerable amount of dross which, of course, is then introduced into your new alloy. A very good flux to use in this instance is chloride of zinc, which should be added in the proportion of 2 or 3 ounces per 100 pounds of mixture, according to the amount of dross carried.

On the other hand we should advise you to try the first method mentioned and make tensile tests with your resulting material to see if you have the required strength. The method that you proposed by melting the two metals in separate receptacles is open to the objection made above, that an undue amount of dross is carried and as you have only one melting you do not have opportunity enough to eliminate all of the dross. The writer has made aluminum castings consisting of 92 aluminum and 8 of copper by the so-called absorption method as outlined and obtained a tensile strength per square inch of 40,000 pounds.—K.

Q.—I am having a difficulty to make a gun metal alloy for plugs of cocks and valve seating to withstand high pressure, superheated steam. Could you kindly give me an alloy suitable for the purpose in your columns for "Shop Problems"?—W. J. M.

A.—The Metallurgical Co., Milburn House, Newcastle-on-Tyne, is putting an alloy on the market for valves, etc., for superheated steam, known as K. V. B. Quality Manganese Bronze. Monel metal has proved very successful for seats and plungers that are liable to wire-draw. The contact surfaces only are usually made of the monel metal, the other parts being common brass. Monel metal may be obtained from the Oxford Copper Co., New York, U. S. A. or Basse & Selve, Altona, Germany. —J. L. J.

BURNING

Q.—Could you oblige us with a method for burning aluminum castings?

A.—Aluminum castings may be burned in a similar manner to that used for brass. It is necessary to bring the aluminum to a good red heat.—J. L. J.

COLORING

Q.—Kindly state what would be the difference if yellow arsenic were to be used in a green gold solution instead of white arsenic; also how much of it is necessary in a gallon solution to produce a perfect black green gold; and is it best to use it hot or cold?

A.—Yellow arsenic can be used. Prepare a saturated solution by dissolving as much yellow arsenic in a warm solution of caustic soda as it will absorb. No different results will be obtained. One is an oxide of arsenic and the other is an arsenious acid. A warm solution of gold gives the best results. Care should be taken not to add too much arsenic to the solution.—C. H. P.

Q.—What is the cause of gold goods losing their luster?

A.—Your gold is too soft; 10-k. gold should always contain a small amount of nickel in order to harden it and cause it to wear bright.—O. A. H.

Q.—Please publish a formula for producing the blue color on gun and pistol barrels by dipping.

A.—The genuine finish is produced by heating the barrel after it has been thoroughly cleaned, and is a difficult process. An imitation can be produced by the following formula:

Water	1 gal.
Acetate of lead	4 ozs.
Hydrosulphite of soda	4 "

Dissolve in boiling water, using an enameled kettle for the purpose and maintain at that temperature.

The steel articles should be polished and free from grease as before mentioned. When immersed the color first becomes straw color, then yellow, next purple and finally blue. Wash and dry out carefully and to protect the color lacquer with a transparent dip lacquer which can be purchased at platers' supply houses. See our advertisers of lacquers.—C. H. P.

DEPOSITING

Q.—What is the constitution of a bath suitable for depositing tin on copper so as to get a deposit about 1-32 of an inch thick? Also at what temperature should the bath be employed, and what voltage? What method could be pursued to tin brass tubes inside and out?

A.—Tinning solution for your purpose should consist of the following formula:

Water	1 gal.
Caustic soda	1 lb.
Hypo-sulphite of soda	½ lb.
Chloride of tin	½ lb.

This solution can be used with a voltage ranging from three to six volts. The temperature 120 degs. A cold solution gives good results.

To prepare the solution dissolve the caustic soda in the water, then add the tin salt. When a clear solution is obtained add the hypo-sulphite of soda. Use anodes of pure tin.

It will be necessary to cleanse the tubes inside and out by acid dips to procure a clean metallic surface. To deposit inside the tubes it will be necessary to use a wire made up of pure tin, to use as an anode inside of the tube. This can be made of suitable size, and must be insulated from the inside of the tube, in some manner, to prevent a short circuit. The deposit can be brightened by scouring with fine sand or polished with regular buffs.—C. H. P.

DIPPING

Q.—Will you please advise how to make a good ormolu dip? I have not been successful using lactic acid.

A.—To prepare an ormolu dip for brass proceed as follows: Dissolve in one gallon of 38 per cent. yellow aqua fortis 6 ozs. metallic sheet zinc. Allow this to cool and add slowly one gallon of oil of vitriol, 65 per cent., stirring thoroughly.

The dip should be used hot. This is accomplished by surrounding the acid pot with hot water, maintained at the proper temperature with a steam coil. After the matt surface is produced the articles are rinsed in cold water and bright dipped as usual.

Note.—The ormolu dip should be constantly stirred when in use. If the matt fails to develop add a small amount of water. If the matt is too coarse add a little more oil of vitriol; if too fine, add more aqua fortis.—C. H. P.

ETCHING

Q.—Please give a formula for etching on cast iron, such as a shear blade with the pattern in relief.

A.—For etching cast iron use a solution of nitric acid mixed with water 14 to 18 B. The best method to use in preparing the surface to be etched would be as follows: Have a copper plate engraved or a stone engraving, then print the design with asphaltum ink on rice tissue paper, warm the metal surface slightly, apply the printed paper and smooth down with a rubber roller such as photographers use. Then dry thoroughly and etch. A dilute solution of nitric acid can also be used with a reversed current. For electro-etching about 5 B. would be sufficient strength. After etching remove the etching ink with gasoline or benzine.

FUSING

Q.—Can you explain the following phenomena—a high-class, white, anti-friction metal of these proportions:

Tin	86 lbs.
Antimony	8-8 "
Copper	5-8 "
	100 lbs.

is run into a casting of government gun metal:

Copper	88 lbs.
Tin	10 "
Zinc	2 "
	100

This proving defective, some white metal was melted in *iron* pot, fusing at 460 degs. (approximately), the bearing was put in metal when fluid, to melt out white metal. After fifteen minutes of (part) submersion the government gun metal casting (½ in. thick) was honeycombed to the extent of 50 per cent. of its weight of part submerged. Why should white metal at 460 degs. (approximately) fuse government gun metal that takes three times the amount of heat in the ordinary method of melting? Is the action chemical? If so, which is the active agent and what sets up this action primarily?—C. H.

A.—The action you mention is not a chemical but a physical one. The government gun metal casting dissolves in water. A good way to remove a babbitt lining from a bearing is to melt it out with an oil or gas blow-torch.—J. L. J.

MELTING

Q.—I am melting the following mixture in an oil furnace and my loss is over 9 per cent. What loss would be right for this mixture and how can I improve the shrinkage? The mixture is:

Brass turnings	74 pounds
Brass castings and gates	293 "
Copper ingot	154 "
Lead	12 "
Zinc	77 "
Total	610 pounds

A.—The loss on the mixture you give should be less than 4 per cent. It is suggested that you increase the air pressure to 20 ounces. If you have an excess of oil (which will be indicated by the odor of oil) your shrinkage will be high and a large excess of oil will also cause high shrinkage. Aim to secure perfect combustion and then you will obtain a low shrinkage, hot metal and quick melting.—J. L. J.

TINNING

Q.—Please publish a formula for tinning a kettle without a battery. The kettle is iron and will be in constant use.

A.—The best method for you to pursue would be to coat the iron kettle with metallic tin. This can be accomplished without much difficulty in the following manner: Clean the iron kettle first, if rusty, with a little muriatic acid. Then wash with water, afterwards scour with sand to produce a clean surface. Now coat the cleansed surface with chloride of zinc solution. This is the common soldering acid used in soft soldering. This acid can be prepared by adding sheet zinc to the muriatic acid until it will absorb no more, or sufficient can be purchased from any plumber. After coating the surface with the acid proceed to heat the kettle over a charcoal fire or hard coal fire until when touched with a piece of common half and half solder it will melt. In the meantime while the kettle is heating, melt a pound of tin or more according to the size of the kettle. When the kettle and tin have reached the proper temperature, place 1 or 2 ozs. of sal ammoniac in the kettle and then add the tin. A swob should be made of tow, such as used by plumber, so that the tin can be rubbed over the surface of the kettle. In this manner a successful coating can be applied.

Note.—If the tin does not take readily in some spots apply more of the soldering acid mentioned.—C. H. P.

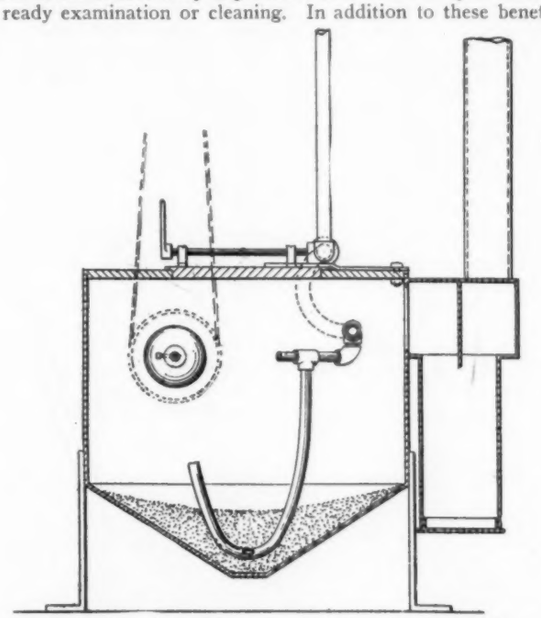
PATENTS

REVIEW OF CURRENT PATENTS OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

955,714. April 19, 1910. Sand-Blast Apparatus. George T. Steedman, of St. Louis, Mo.

The object of this invention, as shown in cut, is to provide a dependable supply of sand to the sand nozzle. To be able to regulate the abrading action of the blast. Also to provide a sand blast of simple construction that can be manufactured at a low cost.

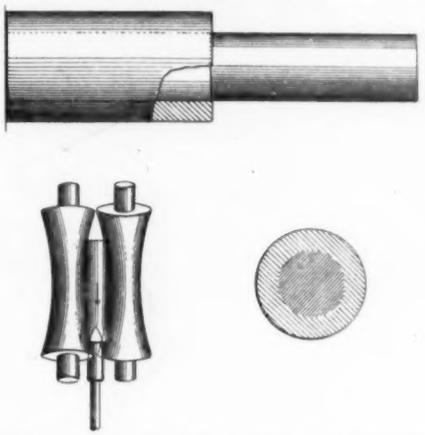
In previous sand blasts of the character as this invention it has heretofore been customary to regulate the supply of sand sucked into the sand conduit by means of a sand gate or valve which, according to its area, would permit a greater or less amount of sand to pass into the sand conduit. By this device the sand gate is done away with entirely, entire regulating apparatus consists in bringing the terminal of the sand conduit adjacent to the surface of repose of the sand pile. This produces a feed which is absolutely dependable and which is open to view for ready examination or cleaning. In addition to these benefits



the method of sand supply control makes it possible to regulate the amount of sand drawn into the conduit by increasing or decreasing the suction produced in the blast tool. Decreasing the suction at the terminal decreases the amount of sand drawn into the conduit, or conversely, the greater the suction at the terminal the greater the amount of sand drawn into the conduit. As the supply of sand is dependent upon the suction a sand blast is provided, which is regulable by means of the manual valve attached to the sand tool. Whenever this valve is closed no suction is created and the sand pile has its surface untouched. A small opening of the valve produces a comparatively gentle blast of air and a comparatively gentle suction, and consumes a relatively small amount of compressed air, while a large opening of the valve gives a stronger blast and a greater amount of suction with a corresponding increase in air consumed.

959,518. May 31, 1910. Art of Reducing Hollow Articles of Metal. William Griffith, Pittsburg, Pa.

In carrying out the details of the process covered by this patent, and shown in cut, the following operations are performed: A hollow article of iron or steel is subjected to a cleaning operation, such as pickling, then, if desired, the article is immersed in an alkaline solution to prevent further oxidation of the metal. The article then receives a metallic deposition by being subjected to a solution of metallic salt, after which treatment the article receives a core of copper or other metal either by pouring or insertion. An outside coating of sheet copper or other metal may then, if desired, be given the article. The product thus produced is placed in a heating furnace and heated to a point slightly below the melting temperature of the interior metal. It is



then withdrawn from the furnace and passed through rolls or pressure device until the metals are welded to each other. If the metals have, during the preceding operations, been chilled the article to be treated is again placed in a reheating furnace and reheated, after which, and after it has been removed from the reheating furnace, it is pierced through the interior core of copper or other softer metal by a piercer of somewhat smaller diameter than the diameter of the copper or other metal core. This piercing may be done in the manner ordinarily practiced in the manufacture of seamless tubing.

960,257. June 7, 1910. Manufacture of Molds for Casting Metal. E. L. Bohl and R. Y. Barrows, Rutherford, N. J.

The patent covers a process or method of making molds and other articles which consists in forming a mold or other article from a composition of matter containing plaster of paris, painting or covering the mold or other article with an oleaginous substance and heating the mold or other article in an oven, the oleaginous substance being melted lard or any other substance having similar qualities, the object of covering or painting the mold with an oleaginous substance and then heating and drying said mold in an oven, being to prevent the mold from absorbing moisture from the air or otherwise, the composition employed being preferably plaster of paris and ashes.

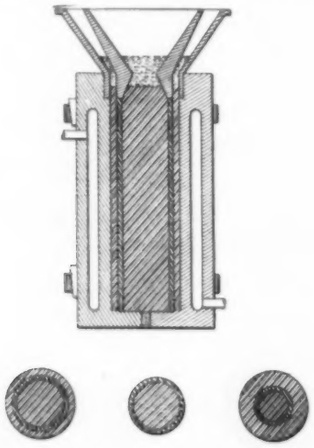
960,973. June 7, 1910. Method of Making Cores of Sand. G. W. Lewis, Scranton, Pa., assignor to S. H. Baird, New York.

This is an improved method of making cores which consists in, first, mixing the oil and water very intimately so as to form an emulsion; then mixing the emulsion so formed with the sand; and finally, forming the core and baking it in the usual manner. It has been found by experiment that the quantity of oil required by this method is much smaller than by the old methods. The proportions of oil and water employed in the improved method will ordinarily range from fifty per cent. of oil and fifty per cent. of water to twenty per cent. of oil and eighty per cent. of water; but proportions outside of this range may also be found to give satisfactory results.

In mixing the oil and water for making cores according to this invention, any suitable form of mixing apparatus may be employed, and the oil used is the same as that employed in the making of cores by the methods now in use.

960,372. June 7, 1910. Compound Metal Object. John F. Monnot, New York, assignor to Duplex Metals Company, New York.

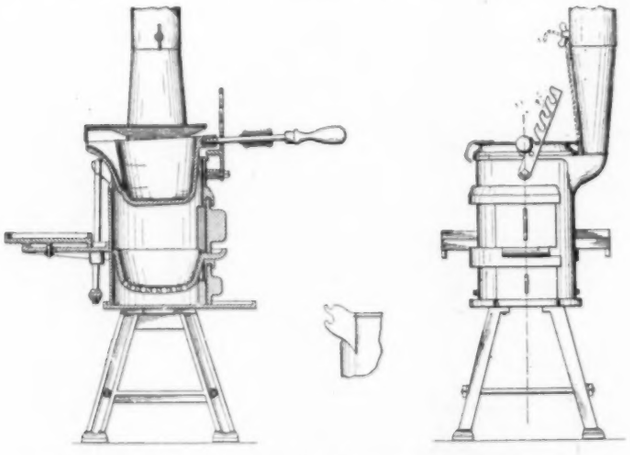
This invention relates to the manufacture of compound metal objects, and the present patent is an improvement on previous processes invented by the same inventor. These patents have already been described in previous issues of THE METAL INDUSTRY. The molds, etc., shown in the cut are used for the purpose of producing these compound metal objects, which consist of objects having an inner or body portion composed of soft and



ductile metal, such as copper, and a weld-united outer portion of harder and stronger metal, such as steel. Electrical conductor wire comprising a core of high-conductivity metal, such as copper, and a shell of harder or stronger metal, such as steel, is desirable for many purposes, as its electrical properties are in many respects different from ordinary copper wire, or from steel-cored copper-coated wire, even though the copper-coating of such wire be quite thick.

961,182. June 14, 1910. CASTING APPARATUS. G. H. Vining, Kansas City, Mo.

The objects of this invention as shown in cut are to provide a furnace and a crucible which latter is adjustable on the former and acts to a certain extent as a damper for regulating the fire in the furnace; second, to provide an adjustable table for supporting objects, such for instance as journal-bearings, beneath

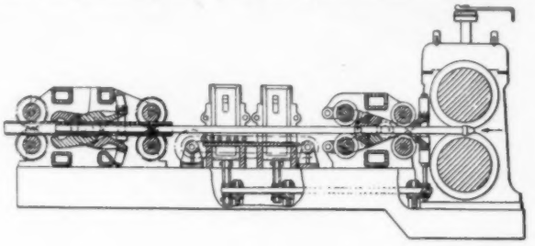


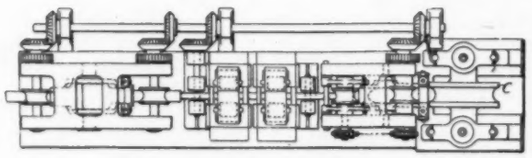
the spout of the crucible so that when the latter is tipped up to pour the molten metal therefrom the same may be properly distributed throughout the object by moving the table backward or forward; third, to provide means whereby the crucible may be lifted from the furnace and carried some distance therefrom preparatory to pouring the molten metal.

961,818. June 21, 1910. TUBE-ROLLING MILL. Heinrich Stüting, Witten, Germany.

This is a process for the production of seamless tubes, and includes improvements as shown in cut, in rolling mills for the manufacture of such tubes, of the kind comprising a plurality of independent rolling mills arranged behind one another in which the mandrel of each mill has abutments at each end.

The improvements consist in arranging the two abutments of each mandrel behind the reducing rolls of its respective rolling mill and in providing means whereby the abutments are thrown

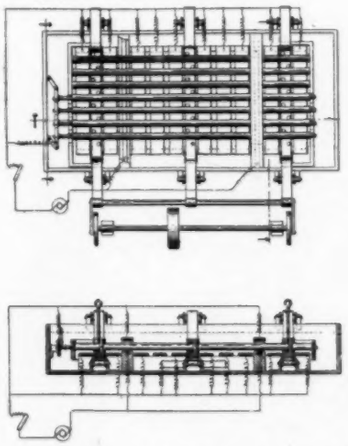




out of operation automatically by the tube as it passes from one abutment to the next. Any desired number of sets of rolls may be employed arranged behind one another.

962,655. June 28, 1910. APPARATUS FOR ELECTROPLATING PIPES. D. H. Murphy, New Castle, Pa.

A process for the electroplating of pipes, etc., by which the apparatus shown in cut is made use of. A tank is used to contain the plating solution, and in this tank, by suitable means, the pipe or rods to be plated are supported and have a reciprocating rotary motion imparted thereto, as a result of whch the entire external surface of the rods or pipe is exposed to the plating operation, with the result that a uniform deposit is secured. By this means is obviated the necessity for having a large tank, which would be required were the rotary motion of the rod or pipe a continuous one, and in this way the disadvantages incident to an extensive equipment are avoided.



In the plating of pipe use is made of anodes consisting of metal rods located inside of the pipe, and means is provided by which the reciprocating rotary motion referred to displaces the pipe relatively to the internal anodes in such a way that the inside surface of the pipe receives a uniform deposit of the material used in the plating operation.

The present invention also contemplates an improved means for handling the rods or pipe in placing them in the planting tanks and removing them therefrom, by which a single handling mechanism is able to serve a number of plating tanks at the same time.

INDUSTRIAL

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

OSBORN DIRECT-DRAW ROLL-OVER MOLDING MACHINE.

The new Osborn molding machine shown in the cuts, Figs. 1 and 2 are illustrations, say the manufacturers, of extreme simplicity of construction, ease of operation and perfect accuracy. It is possible with the machine to make a great variety of dry-sand and green-sand cores, or drags with great increase in output. One average workman—not a molder—can do more work and better with this machine than a number of men with the ordinary equipment.

FIG. 1. OSBORN DIRECT-DRAW ROLL-OVER MOLDING MACHINE. STARTING THE OPERATION.

The Osborn direct-draw roll-over is exceedingly strong, simple and compact. It takes up little floor space, has no complicated parts or adjustments, and needs no attention from skilled molders or mechanics. The flask, or pattern, is set on the plate-frame and rammed, the bottom board or drier plate clamped in position, and the frame rolled over by hand, revolving easily on a horizontal axis.

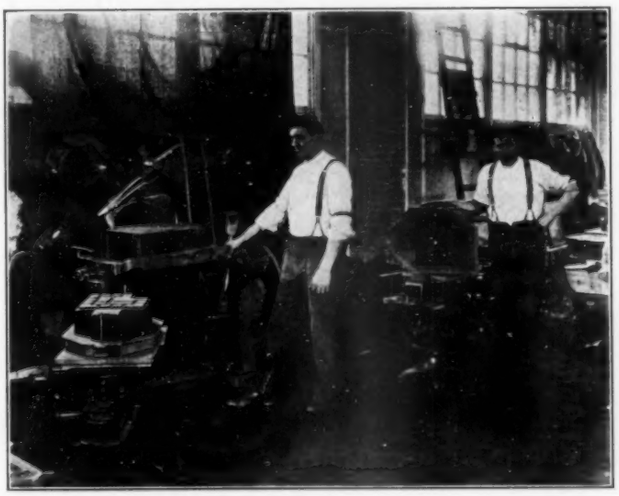


FIG. 2. OSBORN DIRECT-DRAW ROLL-OVER MOLDING MACHINE. THE FINISHED MOLD.

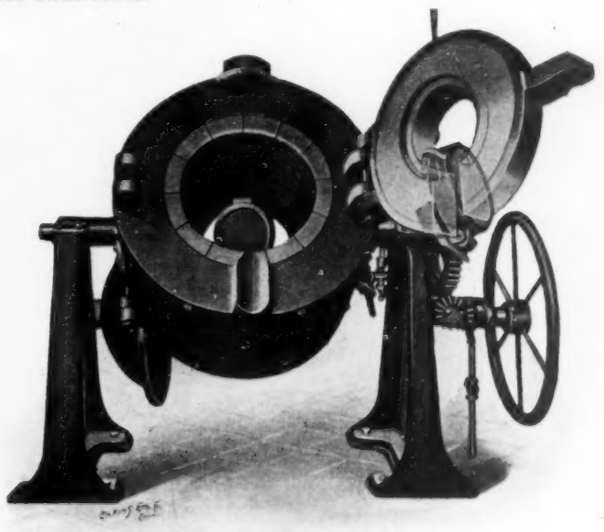
The drawing table is swung into place, and adjusted to depth of flask—the automatic leveling pins at the four corners compensating any unevenness of bottom boards. These pins are then locked, the clamps removed, and the mould drawn by a half-turn of the crank.

As shown in the illustration, Fig. 2, above, this machine produces a mold that is absolutely perfect and without a crack or broken edge. It makes printing-back unnecessary, but nevertheless it will print back with infallible accuracy. The size of machine shown in the article is adapted to iron flasks 17 ins., 18 ins., 19 ins. and 20 ins., in width and any length up to 26 ins., with maximum pattern-draw of 7½ ins. If wooden flasks are used, the capacity is slightly less. It is distinctly an innovation in molding machines, and furnishes the most speedy, accurate and economical means ever devised for the molding of green-sand or dry-sand cores.

As will be seen by referring to the advertisement of The Osborn Company in this issue, the line of molding machines manufactured by this company are particularly adapted for use in foundries making brass and aluminum castings. Further information can be had regarding these machines by addressing The Osborn Manufacturing Company, 5407 East Hamilton avenue, Cleveland, Ohio, and inquiring for catalogues.

THE HAWLEY OIL CRUCIBLE FURNACE.

The furnace shown in cut is manufactured by The Hawley Down Draft Furnace Company, Chicago, Ill., and is claimed to be possessed of many advantages. Some of these special features are the ready adaptability of the furnace to all conditions. The furnace uses either oil or gas for fuel and the flame does not come in direct contact with the crucible, but travels around it, thus insuring longer life to the crucible. The furnace can be used with any size of standard crucible, from No. 40 to 125, by simply changing the thickness of the lining and also can be used as a stationary or tilting furnace without any change in the construction.



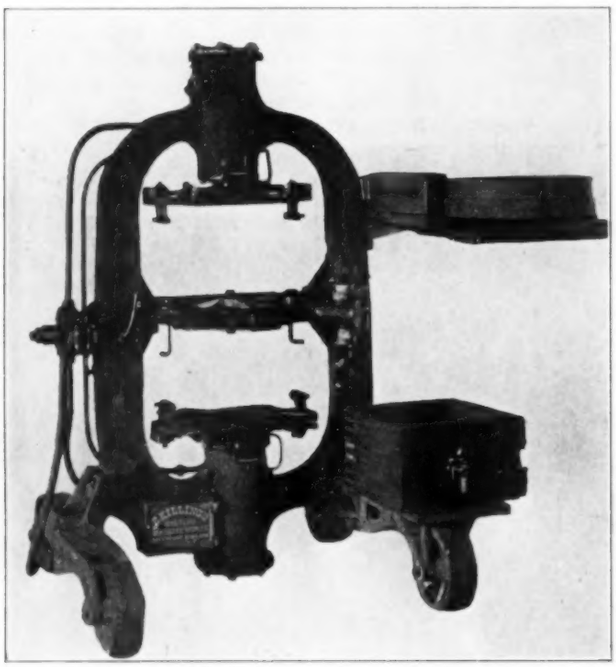
HAWLEY OIL CRUCIBLE FURNACE.

The crucible is so placed in the furnace that no bricks are wedged in to keep it in place. The time required to melt a heat, using either compressed air or a blower, is from 45 to 60 minutes. The flame finds its exit in the rear of the furnace and may be directed up, sidewise or downward, as best suits the con-

ditions of location. While the furnace is in operation all doors are tightly closed, thus retaining all the heat inside of the furnace and raising its efficiency. When pouring the small flap on cover shown in cut is thrown back and when charging, the smaller top door is opened without exposing the crucible. The large door is only opened when the furnace is used as a stationary one and the crucible must be lifted out. The furnace proper is constructed of the strongest kind of material and is supported on cast iron standards.

KILLING AUTOMATIC SQUEEZER "DUPLEX."

The molding machine shown in cut has only recently been placed on the market. It was shown in operation for the first time at the Detroit convention of Allied Foundrymen's Associations, June 6 to 10, by The E. Killing's Molding Machine Works. According to the manufacturers the machine embodies new features which make it the most complete power squeezer on the market, and it is to be marked that nearly all the work is done by the machine, so that there is left to the helper only the shoveling of the sand, and the taking of the complete mold away from the machine. This machine sifts the sand on the pattern, by means of a small air cylinder; squeezes cope and drag at the same time; vibrates the patterns; and lifts the cope and drops the drag, and closes the mold automatically.



THE KILLING AUTOMATIC SQUEEZER.

To start work on this machine, the pattern plate is swung out on the right side. The sand is shoveled in the riddle, and by swinging the riddle bracket over the flask, the air starts the riddle. Having riddled enough sand the bracket is swung back again, which shuts the air off automatically. The squeezer board is placed on the drag, clamped to the pattern plate by means of a spring clamp, which will release itself as soon as the machine begins to squeeze the mold. The next operation is to revolve the drag clamped on the pattern board, by releasing the lever which holds the pattern plate in either position. The cope side being up now, is also filled with sand, by the same method, as the drag and the pattern plate with cope and drag connected to same is swung within the frame. The air is started, and the two pressure plates come down to the cope, and drag, respectively, squeezing same.

The machine is built in two sizes, size No. 1 to take snap flasks up to 14 ins. square, or iron flasks up to 16 ins. square. Machine No. 2 to take snap flasks up to 20 ins. square. The machine is mounted on four 10-in. roller bearing wheels with 4-in. face, which makes it easy to move along the foundry floor, so that the time which must be spent in taking the molds away from the stationary squeezer is eliminated. It is confidently expected that with proper working a mold can be made every minute on this squeezer. For catalogues address E. Killing's Molding Machine Works, Davenport, Iowa.

METHOD OF USING STEEL BALLS FOR BURNISHING SMALL METAL GOODS.

The Abbot Ball Company, of Hartford, Conn., give the following instructions for the use of steel balls for burnishing small metal goods.

Burnishing with steel balls is a very simple operation when it is understood what the operation really is. To make it clear we will first draw attention to the method of burnishing with a hand burnishing tool, the working end of the tool requires to be very hard and finished very smooth, and the pressure of this tool against the rotating piece of work, in connection with the proper lubricant or soap mixture on the work and tool, produces the highly burnished or polished surface. So in burnishing with steel balls the balls must be very hard and finished very smooth, in this particular the same as the burnishing end of the hand burnishing tool, then with a sufficient quantity of these balls put into a properly shaped tumbling barrel, together with a soap mixture or burnishing compound and the articles to be burnished, with the barrel rotating these balls slide in and out, over and under the articles, and providing there is a sufficient weight of balls, they will have the same effect in burnishing the articles as a hand burnishing tool has when pressed against a rotating piece of work.

BURNISHING COMPOUND.

The soap which is used with this process is quite important, as ordinary soap will stain the work and frequently attacks the balls. The best kind of soap is that which is quite mild. And there are several burnishing compounds on the market for this particular purpose which are giving very good results.

TUMBLING BARRELS.

A horizontal barrel gives best results in this process and requires to be of wood or wood-lined, as a metal barrel, the metal being soft will scratch and mar the work, destroying the finish put on by the balls. The barrel must be irregular in shape on the inside, octagon being preferred, as with a perfectly smooth barrel (on the inside). The contents being slippery with the soap mixture, the barrel would slide around them, leaving them standing still. It does not want, however, to have any projections standing out on the inside which would lift the articles or balls, thereby letting them drop and bruise the work, for the same reason the speed of the barrel should not be great enough to carry the contents up too high on the inside of the barrel.

It is very necessary to keep the contents of the barrel perfectly clean and free from anything of a gritty nature, and if in tumbling the articles show to be dark and smutty it is best to wash the contents out and put in fresh compound.

SAND TUMBLING.

If the articles to be burnished have fins or burs left from the blanking dies, or if it is desirable to have the edges or corners rounded over, this can be done very nicely by putting them into a metal barrel and tumble with ordinary builders' sand and water, they should be thoroughly cleaned after this operation before putting them into the barrel to be burnished.

SIZE OF BALLS.

Many concerns have attempted to use the process, but without much success because they used too small quantities of large size balls. To get good results you must use a sufficient quantity of balls to keep the articles well separated in the barrel, so that they will not rub together, but against the balls. The small balls also give better results, for the reason that in using ¼-inch balls there would be four points of contact or rubbing surface against the work in one inch of space. With ⅛-inch balls there would be eight points of contact in the same space, therefore it would take twice as long to get the same burnishing effect with ¼-inch balls as it would if ⅛-inch balls were used. Also the

⅛-inch balls being smaller have smaller points of contact, and have a better burnishing effect, and get into smaller corners and crevices, and are not so apt to bruise the corners of the work.

The Abbot Ball Company manufactures these steel balls expressly for tumbling barrel purposes, and further information and samples can be had by writing to them at 14-18 Hicks street, Hartford, Conn.

R. D. WOOD & COMPANY'S LEAD PRESS AND HYDRAULIC HOIST.

The cut Fig. 1 shows the type of lead press designed and manufactured by R. D. Wood & Company, Philadelphia, manufacturers of hydraulic tools and machinery. The machine is a heavy press especially designed for forcing lead or other material into such shapes as may be desired. The machine is designed for any pressure up to 6,000 pounds per square inch, and any power necessary to perform the work. A press of this description has been installed at the Frankford Arsenal, at Frankford, Pa.

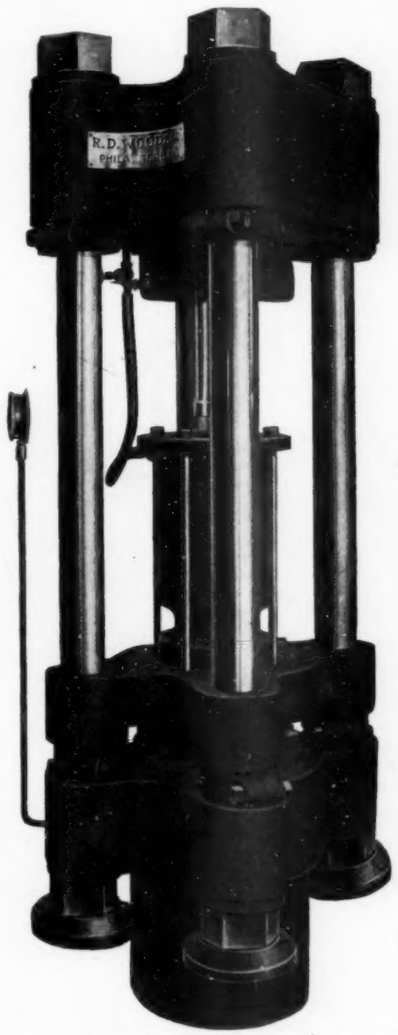


FIG. 1. R. D. WOOD & COMPANY'S LEAD PRESS.

The same company manufactures a line of hydraulic jib cranes, electric transfer tables, cutting-off machines, hydraulic accumulators, pressure pump and hydraulic hoists suitable for foundries, etc. of all sizes. We show a cut Fig. 2 of one of these hoists. This is a hydraulic platform hoist and the usual working pressure is 300 pounds per square inch. The platform may be square, rectangular or round, the last named type to revolve.

The motion is controlled from the platform and is arranged to stop automatically at top and bottom. The standard sizes of these hoists are:

4,000 pounds capacity	8 to 32 feet lift
6,000 pounds capacity	8 to 32 feet lift
10,000 pounds capacity	8 to 32 feet lift

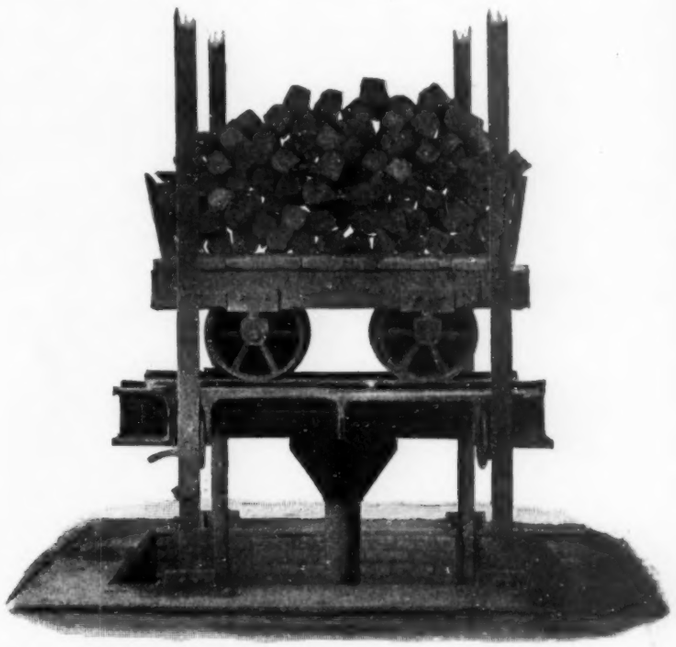


FIG. 2. HYDRAULIC FOUNDRY HOIST, R. D. WOOD & COMPANY.

Larger sizes for mill and railroad service are built to order. Additional information can be obtained by applying for the sixth edition of catalogue of hydraulic tools, cranes and machinery to R. D. Wood & Company, Philadelphia, Pa.

BELT STRAPPING ATTACHMENT.

A machine that drew considerable attention at the Detroit convention of Allied Foundrymen's Associations, when it was exhibited for the first time, was the "Belt Strapping Machine" here illustrated. This machine is manufactured by Frederic B. Stevens of Detroit, Mich., and he claims among other things for the device, "That manufacturers of plumbers' goods, brass cocks, cutlery, automobile parts and metal surfaces that are inaccessible with regular polishing wheels, will find it indispensable." He says that a workman can turn out more and better work when peculiar shaped castings are to be polished than with the ordinary wheels.

The attachment is used with any suitable driving machine, and driving pulley is made with an arbor of such a size that the belt cannot run off.

The belt is "set up" with glue and emery, and being flexible readily shapes itself to the piece of work that is being polished. The machine is provided with an adjusting device, which is simple and effective, and the machine runs without vibration.

The machine as now furnished has a 12 ins. diameter, 4½ ins. face driving pulley and 6 ins. diameter, 4½ ins. face pulley attached to the machine. The specifications are: Height over all, 40 ins.; weight complete, 110 lbs.; horizontal adjustment, 15 ins.; vertical adjustment, 6 ins.; floor space required, 8 x 16 ins. Further particulars may be had by corresponding with Frederic B. Stevens, Detroit, Mich.

FARWELL SQUEEZERS FOR USE WITH KEEP SYSTEM OF HINGED MATCH PLATES.

Fig. 1 shows the new type of Farwell squeezer that has been developed for use in connection with the hinged match plate system invented by W. J. Keep, superintendent of the Michigan Stove Company, Detroit, Mich. This machine will be placed on the market for the benefit of those who adopt the Keep system and the Adams Company, Dubuque, Iowa, will supply the squeezers as well as special equipment required to all foundries who are licensed to use Mr. Keep's invention.

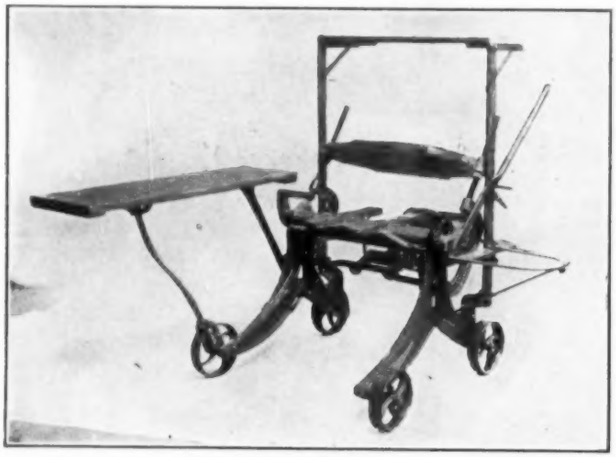


FIG. 1. FARWELL SQUEEZER FOR USE WITH KEEP SYSTEM.

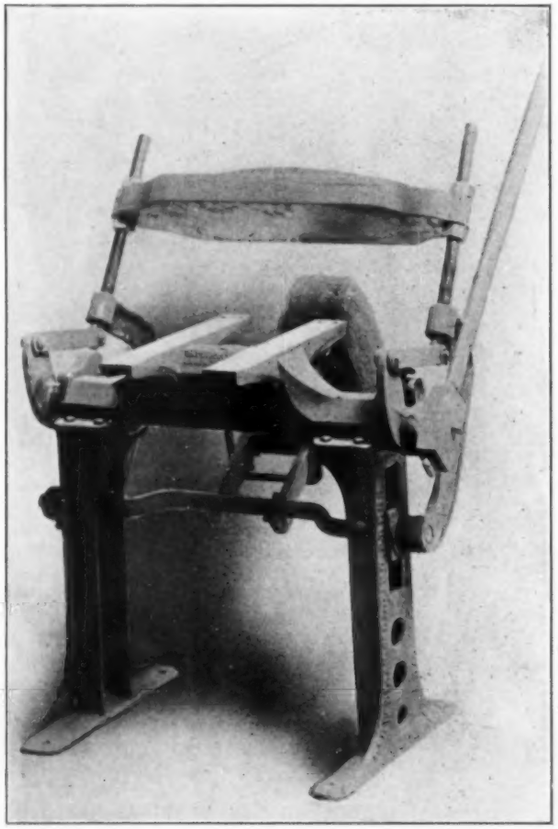


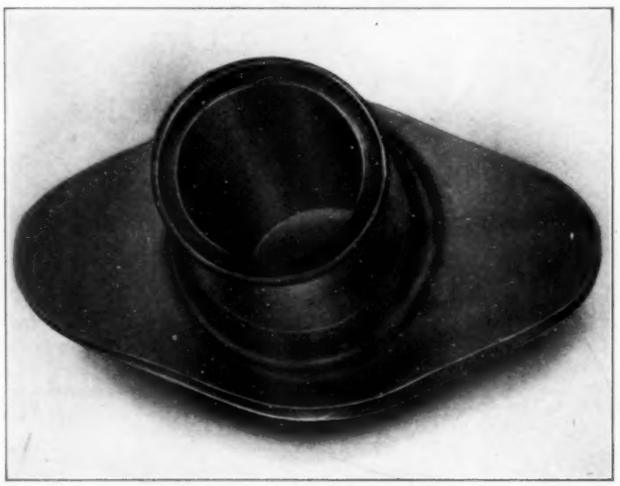
FIG. 2. 24-IN. STATIONARY FARWELL SQUEEZER.

The Keep system employs hinged snap flasks and a match plate, provided with lugs which fit into the hinges of the flask, thus making it possible to roll up the cope and the pattern. In order to allow for this, the squeezer top is arranged so that it will swing farther back, and the table is provided with a special flask supporting device not shown in cut. The flask supporting device operates two pins which support the back side of the drag when the cope is rolled up. This is necessary in order to prevent the drag from being tilted by the weight of the cope.

Fig. 2 ilustrates the new 24-in. Stationary Farwell squeezer which is very similar in construction to other Farwell squeezers except that the table is raised higher above the rocker shaft, and it is not necessary for the top to swing through so great an arc in clearing the table. This makes it easier to bring the top forward into squeezing position, while the new form of table brings the mold up above the links which connect the rocker shaft with the side arms, thereby making it possible to use a larger flask in proportion to the width of the machine, and removing the danger of molder striking his knuckles against these links when riddling sand. This machine, which measures 24 ins. between side rods, will take a flask 18 ins. long or within 6 ins. of the width of the machine, whereas on the ordinary 30-in. squeezer which measures 30 ins. between side rolls, flasks longer than 22 ins. are not handled conveniently.

REAMING OPERATIONS WITH AQUADAG.

Aquadag or deflocculated Acheson graphite gives excellent results in reaming or saw cutting, if used in the proper proportions with a good cutting compound. This is the experience of the Niagara Machine Company, Niagara Falls, N. Y. The photograph here shown tells the story of a reaming operation on a bronze casting. The Niagara Company say that they had occasion to ream 3,000 holes one inch in diameter in these castings. These holes had to be finished to size and absolutely smooth.



BUSHING REAMED WITH "AQUADAG."

The ordinary cutting compound without Aquadag would make the holes a trifle small, and thereby take a good deal more power to ream the hole through, but with the addition of Aquadag this is overcome and the hole reamed to size and as smooth as is possible to make it. The cut shows the wonderful smoothness of the bore. Aquadag is manufactured exclusively from Acheson deflocculated graphite by The Acheson Graphite Company, Niagara Falls, N. Y., who will gladly furnish samples and information upon request.

COMPARATIVE ELECTRICAL CONDUCTIVITY OF ALUMINUM AND COPPER.

The Engineering Society of Milan publishes a paper in which aluminum is compared with copper for electrical work. For the same conductivity an aluminum wire is 28 per cent. thicker than copper, but weighs only ½ as much, and at average prices would cost 37.5 per cent. less.

For the same increase of temperature due to resistance the aluminum wire is 18 per cent. larger, weighs 42.5 per cent. as much and would cost 40 per cent. less.

Aluminum wire is excellently protected against the weather by the thin film of oxide which always forms on its surface, and it holds ice in winter less than copper.

Associations and Societies

DIRECTORY OF AND REPORTS OF THE PROCEEDINGS OF THE METAL TRADES ORGANIZATIONS.

NATIONAL ELECTROPLATERS' ASSOCIATION OF THE UNITED STATES AND CANADA.

President, Charles H. Proctor, Arlington, N. J.; Treasurer, H. H. Reama, New York, N. Y.; Corresponding and Financial Secretary, Geo. B. Hogaboom; Recording Secretary, Royal S. Clark. All correspondence should be addressed to the Corresponding Secretary, Geo. B. Hogaboom, 656 Hunterdon St., Newark, N. J. The objects of the Association are to promote the dissemination of knowledge concerning the art of electro-deposition of metals in all its branches. Meets at Grand Opera House Building, 309 W. 23d St., on the fourth Friday of each month, 8 p. m.

The seventeenth regular meeting of the National Electroplaters' Association of the United States and Canada was held on June 30 at the Grand Opera House, 309 West 23d street, New York. Sixteen members were present, and in view of the fact that the society was unable to make arrangements to continue to use the meeting room formerly occupied at the Hotel Chelsea, a committee was appointed to contract a lease for a room in the Grand Opera House building for the coming year. A number of applications were acted upon. A suggested shore dinner was discussed, but no official action was taken. A number of committee reports were received and ordered filed. A committee of three was appointed to constitute an information bureau. The printing committee was instructed to act with the Librarian in issuing a quarterly journal of the society. The first issue will be about September. There was considerable discussion regarding silver-nickel solutions, following which Charles H. Proctor read a paper on "Decorative Effects Produced on Metals by Means of Pigments," and exhibited a number of samples of work, showing the possibilities of the treatment. The date of the next meeting is Friday, July 22, 1910, at 8 p. m.

AMERICAN BRASS FOUNDERS' ASSOCIATION.

President, Wm. R. Webster, Bridgeport, Conn.; Secretary and Treasurer, W. M. Corse. All correspondence should be addressed to the Secretary, W. M. Corse, 1155 Sycamore street, Buffalo, N. Y. The objects of the Association are for the educational welfare of the metal industry. Annual convention with the American Foundrymen's Association in a succession of cities, as invited. The next convention will be held in Pittsburg, Pa., May or June, 1911.

Secretary Corse reports that the membership of this association now approximates 300, and that the publication of a bulletin of news of the society will shortly be started, first bulletin will probably be issued some time during July.

AMERICAN SOCIETY FOR TESTING MATERIALS.

Affiliated with the International Association for Testing Materials.

President, Henry M. Howe; Vice-President, R. W. Leslie; Secretary-Treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia, Pa., to whom all correspondence should be addressed. The objects of the Association are: The development and unification of standard methods of testing; the examination of the technically important properties of materials of construction and other materials of practical value and also the perfecting of apparatus used for this purpose. These objects will be furthered: 1. By the Congresses and other meetings of the Association. 2. By the publication of an official journal. 3. By any other means that may appear desirable.

The Thirteenth Annual Meeting of the Society was held at the Hotel Traymore, Atlantic City, N. J., on Tuesday to Saturday, inclusive, June 28-July 2, 1910.

The report of the Executive Committee was received and it was the sense of the meeting that the amendments proposed to the by-laws be put to a ballot by letter. This was ordered done, and the following are the changes proposed:

1. To abolish the contributing membership class on the ground that adequate financial support for the legitimate running expenses of the Society should be distributed evenly over the membership at large.

2. To increase the dues from $5 to $10 a year with the understanding:

(a) That a Year-Book, bound in cloth, shall be furnished annually to members, containing in addition to the contents of the present annual pamphlet, all standard specifications in revised up-to-date form. There are at present twenty-four standard specifications aggregating 121 pages, which, with the other matter referred to, will make a volume next year of about 275 pages.

(b) That the annual volume of the proceedings shall hereafter be supplied in cloth binding to members without extra charge for binding, and that the additional charge for half-morocco binding shall be 50 cents instead of $1.

(c) That a new class of Junior membership be created, consisting of persons less than thirty years of age, for whom the annual dues shall be $5, and who shall enjoy all the privileges of members.

INSTITUTE OF METALS.

President, Sir Gerard Muntz, Bart.; Treasurer, Professor Turner, M. Sc.; Secretary, G. Shaw Scott. All correspondence should be addressed to the Secretary, G. Shaw Scott, M. Sc., Institute of Metals, Caxton House, Westminster, S. W., London, England. The objects of the Institute are for the educational welfare of the metal industry.

The Council of the Institute of Metals have initiated what is hoped will be an annual series of May lectures.

The first of these took place in London on Tuesday, May 24, when Professor Gowland, F.R.S., vice-president of the Institute, delivered a lecture on "The Art of Working Metals in Japan," which was illustrated by diagrams and lantern slides.

THE AMERICAN ELECTROCHEMICAL SOCIETY.

This association held its 17th annual meeting at Pittsburg, Pa., on May 4 to 7, inclusive, 1910. An unusually large attendance is reported and some very interesting works inspecting visits were carried out. A number of papers were read at different sessions, among them being "A New Method for the Electrolytic Winning and Refining of Metals," by E. M. Chance. "A Comparison of Rapid Electrochemical Methods." Part I, The Determination of Copper. F. C. Frary and A. B. Petersson. "The Electrolytic Deposition of Platinum." Part II. Wm. T. McCaughey and H. E. Patten; and an illustrated address on "The Present Status of the Electrochemical Industries," by Dr. J. W. Richards, secretary of the Society.

ITEMS OF INTEREST TO THE INDIVIDUAL.

THOMAS TURNER.

THOMAS TURNER.

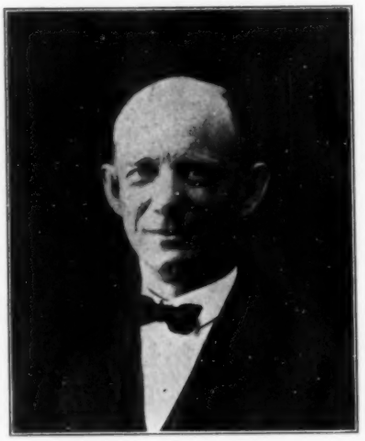
Professor Thomas Turner, M.Sc., A.R.S.M., F.I.C., is professor of metallurgy in the University of Birmingham. He is the author of several text books, the best known being his "Metallurgy of Iron." He has had wide experience as a metallurgical examiner, having acted for 10 years for the City and Guilds in iron and steel manufacture and for numerous other examining bodies. He is, however, best known for his original investigation in connection with branches of metallurgy, having now published nearly 100 papers in different scientific journals. His results, too, have been largely republished in America and in various European countries. The first series of investigations to attract public notice and to lead to immediate practical application were those relating to the influence of silicon on the properties of cast iron, published in 1884-88. These have been succeeded by numerous other papers dealing with steel, iron, brass, slags, and various other metallurgical subjects. He was responsible for the design and equipment of the new metallurgical department of the University of Birmingham, which is believed to be unsurpassed by that of any similar institution in this country or abroad; while as treasurer and member of council of the Institute of Metals from its inception he has taken a lively interest in its remarkably successful development.

In the June number of THE METAL INDUSTRY we mentioned how Geo. L. Wallace, who for many years has been connected with electroplating supply houses, was developing a business of his own. He has since become Eastern representative of the Harshaw, Fuller & Goodwin Company. His territory will include New England and a part of New York, with headquarters in the Taylor Building, Cannon street, Bridgeport, Conn. The Harshaw, Fuller & Goodwin Company are large manufacturers and sellers of chemicals. Their home office is in Cleveland, Ohio, New York office, 100 William street, in charge of Mr. Congdon. Mr. Wallace's last connection was with the Dow Chemical Manufacturing Company, of Mansfield, Ohio, and before that he was for many years with the Zucker & Levett & Loeb Company, of New York.

William M. Corse, secretary of the American Brass Founders' Association, was in attendance at the Atlantic City meeting of the American Society for Testing Materials. At the close of the meeting he visited Dr. C. H. Hillebrand, of the United States Bureau of Standards at Washington, D. C., in reference to the samples now in course of preparation for the committee on Standardization of Methods of Analysis for the Non-Ferrous Metals. On his way back to Buffalo Mr. Corse spent Sunday, July 3, with Secretary Moldenke, of the American Foundrymen's Association, at his castle foundry in the Watchung mountains, New Jersey.

W. H. Logan, foreman of the foundry department for the National Cash Register Company, Dayton, Ohio, has resigned and is now taking a rest pending his re-entry into active business.

W. H. CARPENTER.



W. H. CARPENTER.

William H. Carpenter, the subject of this sketch, is the newly elected vice-president of the American Brass Foundrymen's Association for New England representing the rolling mills. Mr. Carpenter will certainly reflect great credit upon the association, and it is fortunate in persuading him to act as its vice-president. W. H. Carpenter, or "Bill," as he is more generally known, has been connected with the brass business since 1878, starting as one of the first hands with the Seymour Manufacturing Company, of Seymour, Conn. From there he went to the Osborne and Cheeseman Company, of Ansonia, in the old stone mill. His next move was to the Detroit Brass and Copper Company, of Detroit, Mich. From the Detroit mill he came back East and settled at the plant of the Bristol Brass Company, Bristol, Conn., where he is at the present time. While with the last-mentioned company he has passed from caster and salesman to the office of superintendent, which position he now holds. Mr. Carpenter is also vice-president and general manager of The Metal Dross Economy Company, which company is exploiting a process for the effective recovery of metal from dross and skimmings by skimming into water.

Joseph Dimes, who is well known in plating circles, has taken a position as lacquer salesman with the Franklin H. Kalbfleisch Company of New York, with works at Brooklyn, N. Y.; Waterbury, Conn.; Erie, Pa., and Elizabeth, N. J. Mr. Dimes' headquarters will be at Waterbury, Conn., and his territory will consist of the New England States.

H. M. Williams, assistant chemist of the National Cash Register Company, Dayton, Ohio, has started to teach a course in practical chemistry relating to the foundry and plating room with particular reference to the chemical reactions of plating operations. Mr. Williams' lectures are given at the rooms of the local Y. M. C. A.

W. E. Crist, formerly president and general manager of the Crist Valve Manufacturing Company, is now the general manager of the valve department of the O. M. Edwards Company of Syracuse, N. Y.

DEATHS

Hugh Gallagher, for many years a well-known wholesale dealer in brass and other metals, of Brooklyn, N. Y., died June 25 at his home, 1365 St. Marks avenue. He was 61 years old and leaves five sons and four daughters.

William Moffett, Sr., proprietor of the Moffett brass foundry, Chattanooga, Tenn., died at his home in Hill City, on June 22. Mr. Moffett had been a prominent brass foundryman for more than twenty years. He is survived by his wife, one son and one daughter.

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS IN THE DIFFERENT INDUSTRIAL CENTERS OF THE WORLD.

PROVIDENCE, R. I.

JULY 11, 1910.

The manufacturing jewelry factories throughout the Providence districts, including this city, Pawtucket, Woonsocket, Attleboro, and North Attleboro, closed down on July 2 for the usual two weeks' vacation. When closing time came the manufacturers were all in excellent shape for this time of year. There was little talk of hard times, and generally speaking the whole trade was in a strong, healthy condition.

The date for reopening of the factories is July 17. The status of affairs at the present time indicates that business will start off with a hum. Orders for the fall trade are now accumulating rapidly and there seems to be no indication that the jewelers will have a hard time of it during the fall trade. The fall trade is generally one of the best of the year. From now until the Christmas buying is over the factories should be working full time and, as the Christmas rush sets in, overtime work will be in order.

There have been a large number of additions to the ranks of the manufacturing jewelers in recent months, but the increase in the number of establishments has not seemed to lessen the business of the old established concerns. The shutdown now in force comes each summer and gives the manufacturers an opportunity to make necessary repairs, take account of stock, etc. Its length is generally governed by the state of business. While the majority of the shops are closed for two weeks, many will remain closed only one this year. Others will not close until the last week in July and some not until the first week in August. The movement for a simultaneous shutdown was fostered by the New England Manufacturing Jewelers' and Silversmiths' Association with the purpose of bringing about a uniformity of seasons.

The manufacturing jewelers of North Attleboro have inaugurated a movement for better transportation facilities from that town. The co-operation of the North Attleboro and Providence Boards of Trade has been secured in the movement. The North Attleboro jewelers claim that their business is in a thriving condition and that better electric car and steam facilities should be afforded it. North Attleboro has also joined in the movement to secure concessions from the Adams Express Company in the matter of lower rates. The town's chief industry is jewelry manufacture and the product is generally sent out in comparatively small packages, thus making express the better method of transporting it.—E. S. M.

WATERBURY, CONN.

JULY 11, 1910.

This is inventory time in the factories of the Naugatuck valley, and while there is a five-days-a-week schedule in force in nearly all the metal plants, this is found so close to the activity of the times that many of the companies are cutting their vacation periods short. Here in Waterbury only July 4 was allowed to the employees in nearly every shop, except for a small department here and there in the Waterbury Brass Company, Scovill Manufacturing Company, or Chase factories, where the maximum shutdown is for a week only and that in but a very few instances.

For the first time in its history, it is believed, the New England Watch Company allowed but one day off to its employees, and will attempt to take inventory without further shutdown. This is one of the plants operating now on five days a week.

There is a fair business only, but a healthy condition generally prevails in all the various metal industries throughout the Naugatuck valley towns. The prospect is that what orders are now on hand for prompt delivery and those expected during the next few weeks will keep the normal complement of help busy on the summer schedule in all the factories, and that the advent of the fall will find a general boom in practically every line.

In the novelty business, especially, that is the outlook, and for this period these factories are more busy than usual. The automobile industry is partly responsible for the large demand for these products, but there is a good market for them in most other lines, indicating a larger money circulation.

Factory extension is going forward here along the same lines as laid down in the reports during the past few months of new building plans. The Scovill plant has grown so great in the past three years that there is hardly a man among the older employees or even the executive force who can call himself sure of the locations of all departments. New employees have to be taken about by guides. As an example of the expansion of factories here it is unofficially estimated that the additions of the past three or four years cover about thirty-five acres. The only new buildings started during the past month, not previously reported, are a concrete and glass finishing room for the Manufacturers' Foundry Company, 54 x 68 ft., and a one-story addition to the office of the Waterbury Brass Company's plant.

In Torrington the Excelsior Needle Company's plant has closed for ten days for inventory, and the Coe Brass Company's plant for three days.

In Bridgeport, according to reports received here, the new plant of the Whiting Company of Fifth avenue, New York, is causing the owners much difficulty. It is a new model factory for the manufacture of silverware and is located on a site near the railroad at the east end of the city. When it was started, the company planned, it is understood, to take a large number of employees from New York to Bridgeport. Since that time there have been several defections from the ranks of its skilled hands and objections to moving away from the metropolis and other reasons have been given by the men for resigning. On this account it is understood here that the company faces a large financial loss. This is probably particularly gratifying news to the International Silver Company, which has one of its best plants, the Edwards concern, in Bridgeport.

Collections are said to show a slight improvement during the past month and business prospects generally are regarded cheerfully by the metal manufacturers of the Naugatuck valley.—F. B. F.

BRIDGEPORT, CONN.

JULY 11, 1910.

Factories in Bridgeport report good business for the month and all are running full time.

The Bridgeport Brass Company are operating their new tube mill; this firm also recently increased their power plant.

The four-story 150 ft. addition at the plant of The Locomobile Company of America is nearly completed.

The foundry of the Singer Manufacturing Company has ceased operations and castings for the local concern in future are to be made at the Elizabeth, N. J., foundry of this concern. The foundry building, however, will be used by the company for other purposes, employing a greater number of men.

Labor conditions are quiet here and there seems to be some slight demand for skilled help.

It is planned to open the new trade school about the middle of July and a large number of applications for enrolment have already been received. The school was visited on June 28 by delegations from the Board of Trade, Manufacturers' Association and Business Men's Association, all of whom were most enthusiastic over the equipment provided for the school by the Bridgeport Trade School Association, Inc.—W. H. D.

DETROIT, MICH.

JULY 11, 1910.

The industrial exposition which opened in Detroit, Monday, June 20, attracted brass manufacturers from many States, but more particularly those in the city. This event was in preparation for many weeks and the display offered to the public has never been exceeded in the West.

Detroit's industries, particularly the brass, were exploited to their greatest advantage. This exposition meant an expenditure of thousands of dollars. Among the exhibitors that deserve special mention are the following:

The Aluminum Castings Company, American Motor Truck Company, Auto Marine Appliance Company, Detroit Motor Car Company, Briscoe Manufacturing Company, Burrow's Adding Machine Company, Cadillac Motor Car Company, Detroit Copper & Brass Rolling Mills, Diamond Manufacturing Company, Michigan Copper & Brass Company, Hupp Motor Car Company, Michigan Lubricator Company, Michigan Smelting & Refining Company, Packard Motor Company, Regal Motor Car Company.

Brass experts, speaking of the recent Foundrymen's convention in this city, say the castings exhibited by local firms exceeded in appearance and tests those made by the most famous foreign factories.

The general condition of the brass trade in Detroit is about the same as it has been during the past six months. The automobile industry keeps all the plants in vigorous operation. Those engaged in other lines, however, report a let up and expect no decided improvement until later in the season.

In the casting of metals Detroit, in the past two years, has made wonderful strides. One foundry built during 1909 is considered the largest single establishment of the kind in the world, and although the concern has only just moved into its new plant, is unable to keep up with orders.

The latest auto-accessory concern to enter the local field is that of the Huron Radiator Company, capitalized at $100,000. Among the stockholders are L. C. Moore, John A. Stewart, Mark W. Allen, Fred Heiden, W. O. Peck, F. E. Harvey and Malcolm T. Faulkner.

The E M F Automobile Company secured two large building permits the past week. One is for the construction of an addition to the plant at 117 West Jefferson avenue, to cost $20,000, and the other is for a four-story brick addition factory at 65-69 Piquette avenue. These two buildings are in line with the companies policy of expansion necessitated by the constant demand for E M F cars in every part of the world.

The United States Motor Company, of this city, has increased its capital from $16,000,000 to $30,000,000, adding $7,000,000 to the common and a like amount to the preferred, stock. The company now owns sixteen plants.

During recent years fifty automobile companies have been organized in Detroit of which today nearly thirty are producing cars. The total capitalization of these companies is approximately placed at $50,000,000. These figures, however, bear no relation to the enormous capitalization of the General Motors Company and the United States Motors Company. It may be a surprise to know that at present one hundred concerns in Detroit are engaged in the manufacture of automobile parts.—F. J. H.

CLEVELAND, OHIO

JULY 11, 1910.

Despite the warm weather of the past month and the general lassitude of business in some lines, the metal trades all seem to be in excellent condition and report no diminution of business for the months. The outlook is as good as ever, according to prominent dealers located here. Manufacturers of brass goods of all kinds are vying with the automobile industry in making records for themselves. The big factories here engaged in the making of plumbers' supplies, faucets and similar goods say that the demand is excellent. All over the country there is a great amount of home building in progress and as Cleveland is the center for this class of business, the makers here are naturally benefited greatly by the boom.

There seems to be no let up in sight for the auto factories, ten of which are located here. They are working to capacity, several employing night shifts in attempts to keep up with their orders. The brass molding shops, and the plating establishments are all busy as they care to be.

The Gas Fixture and Brass Company, of Cleveland, through its manager, B. F. Keith, has landed two big government contracts during the past month, both of them large postoffice jobs. One is the furnishing of brass and bronze fixtures for the new $3,000,000 Cleveland federal building. It is the largest contract for lighting fixtures ever let in Cleveland and was secured against keen competition from a number of other cities. The fixtures are to be of special design in conformity with the building, which is considered one of the finest ever erected by the United States government. The lobby fixtures are to be of solid bronze, while those in the workrooms and offices will be of standard government designs. The other is a large contract for lighting fixtures to be installed in the new postoffice and federal building at Grand Rapids, Mich. The Cleveland building is to be ready for occupancy by Sept. 1, next.

The Acme Indicator Company, of Cleveland, has been incorporated at Columbus by W. J. Whiting with a capital of $10,000.

A Cleveland man, Albert Moreau, head of one of the largest lighting fixture manufacturing concerns in the middle West, was elected president of the National Lighting Fixture Association, which held its session at Detroit during the past month.

Fire starting from an unknown cause rendered the American Plating Company homeless a few days ago when the Kennard power building, at Summit avenue and West Third street, was almost totally destroyed. The building was a five-story structure and was an easy prey to the flames. Over $100,000 worth of damage was done to the concerns occupying the building. The American Company is preparing to resume business as soon as possible.—McM.

CINCINNATI, OHIO

JULY 11, 1910.

It is estimated in dollars and cents that the increased output for the year will be worth $150,000,000 in the Cincinnati factory colony and manufacturing district alone. This is a fair estimate and may serve as a basis of calculations in figuring on the increased value of goods to be sold by other manufacturers not only in Cincinnati, but in the whole Ohio valley during the year that has just begun so auspiciously.

Great building booms in the West, the Middle West and the Southwest will keep the workers in the metal trades whose interests are especially served by THE METAL INDUSTRY, especially busy during the ensuing year and perhaps for a period of years to come. The government is constantly opening up new areas of land in the great West where man is building new towns and cities of houses equipped in most modern fashion. These are the pioneers who are fomenting the markets whence come the demands that are the basis of the hopes of unprecedented prosperity in all lines during the next twelve months.—C. F.

PHILADELPHIA, PA.

JULY 11, 1910.

Silversmiths and manufacturing jewelers are exceptionally busy assembling sample cases in anticipation of the Christmas trade which they expect to eclipse the best year of the past decade. Upon what specific basis they rest this optimistic forecast is a mystery, but all their preparations are in keeping with the idea that the next Christmas season will be a record breaker in every locality.

Kamakichi Takata, of Tokio, Japan, one of the largest metal and machinery men in Japan, was in this city last week making a personal inspection of the larger foundries and implement factories in and near by Philadelphia.

Orders for 101 new locomotives have been booked by the Baldwin Locomotive Works. This means employment for 18,000 metal workers in all branches of the trade.

On July 13 the shareholders in the Royal Electrotype Company will vote for or against a proposed increase in the capital stock of the corporation from $25,000 to $100,000.—C. H. C.

TRADE NEWS

TRADE NEWS OF INTEREST DESIRED FROM ALL OF OUR READERS. ADDRESS THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK

Additional Trade News will be found under "Correspondence."

It is reported that part of the plant which the National Carbon Company will build at Niagara Falls will be completed before Dec. 1.

The Scovill Manufacturing Company, Waterbury, Conn., has taken out a municipal permit for the erection of an additional one-story foundry building, 55 x 60 feet.

The Bronze Metal Company, New York, successors to The Metal Corporation, owners and manufacturers of Vim metal for bearings, has purchased the Erie Brass Foundry of Meadville, Pa.

The Smyth, Meyers & Haas Foundry Co., East St. Louis, Mo., recently started in the foundry business, report that in the near future they will add brass foundry products to that of gray iron castings.

The Fesler Sales Company, with offices in the Metropolitan Building, New York City, have installed a plating plant at 254 West 23d street. The Fesler Company are manufacturers of fountain shaving brushes.

The Southern Brass Manufacturing and Plating Company, 517 Louisiana street, Houston, Tex., has recently been incorporated with a capital stock of $12,000 to do a general brass casting, finishing and plating business.

The Light Manufacturing & Foundry Company, Pottstown, Pa., are making plans for extensive improvements in connection with their present plant. Their purpose is to equip themselves with the very latest in both foundry and machine shop practice.

The Gray Foundry Company, Reading, Pa., are about to erect a building three stories high, 25 x 40 feet, with a slag roof. The estimated cost is $2,000. This concern has in addition a metal working shop and plating room and they do a considerable brass foundry business.

The old Haight & Clarke foundry on Pleasant street, Albany, N. Y., has been secured by John J. Fitzgerald of Beaver street and will at once be converted into a first-class foundry for brass work. Shipping facilities will be provided by a railroad spur to be run into the yard.

Owing to increased business requirements the Queensborough Brass and Bronze Foundry, of Astoria, L. I., have been forced to add six more metal melting furnaces. This company is now in a better position than ever to accept orders for all kinds of castings in aluminum, brass, bronze, etc.

The Dundee Brass Manufacturing Company, Dundee, New York, which has been running on short time for the last few months, it is reported will now be put in full operation, and more hands will be employed. A. P. Mulvey is now manager of the company, and he reports that the outlook is extremely bright.

Chas. F. L'Hommedieu & Sons' Company, of Chicago, Ill., announce that they have recently put on the market a new polishing lathe termed No. 9, which is to meet the demand for this kind of a lathe. Their business has increased to such an extent that they have recently taken over considerable additional floor space.

The International Acheson Graphite Company will build an addition to its plant on the lands of the Niagara Falls Power Company, at Niagara Falls, N. Y. A short time ago the company completed a very substantial addition to both its local and Canadian plants. The new building will be a furnace room, located to the west of the present buildings.

The South Bethlehem, Pa., plant of the New Jersey Zinc Company has been dismantled and a gigantic zinc plant is now being erected at Palmer, Pa. The new plant will, when completed, be one of the largest in the world for the production of spelter and zinc-white. Several years will be required for the completion of this enormous plant.

The Waterbury Farrel Foundry and Machine Company, Waterbury, Conn., have bought the land where the old passenger depot of the New York, New Haven & Hartford Railroad stood. There are 57,832 square feet in all in the tract and will give the foundry company ample space in which to place the contemplated extension to the present plant.

The Roberts Tube Works, of Detroit, Mich., has now been in operation six months and is doing a good business. They manufacture small sized tubing and they have a plant of 60 x 120, with a number of draw benches in operation and room to put in more. Mr. Roberts, who is in charge of the plant, is an old brass man, being formerly connected with some Waterbury rolling mills.

The Ray Manufacturing Company, Buffalo, N. Y., have within the last year begun to manufacture art metal ware, consisting of various fine ornamental metal goods sold by the department stores. They now manufacture a very extensive line and have an exhibit at their Buffalo factory on Niagara street. For years they have been manufacturers of tableware, such as chafing dishes, etc.

A new foundry will soon be in operation in Bronson, Mich., for the manufacture of castings in brass and other alloys. The new foundry building, 45 x 100 feet, is now in course of construction. William H. Kipp, of Bronson, an energetic business man of the city, is at the head of the new company and will operate it in connection with the Visel-Conover plant already established.

Tegufilm is a chemical compound which will coat the flues and plates of boilers with a thin protective film by means of certain chemical reactions. This product is manufactured by the Chemicalloy Company, who also manufacture special alloys and babbitts according to distinctive requirements. Frank A. Willeson is the general manager of the company, which has been established since 1899.

The Huntington Stove & Foundry Company, Huntington, W. Va., have established a complete and thoroughly modern nickel plating department at their plant on Twentieth street and First avenue. This company has long been considered one of the most progressive in the city, and the installation of the new department is but a further indication of the spirit with which it has been managed.

The Electrical Alloy Company, Morristown, N. J., manufacturers of high-grade resistance materials, including phosphor bronze, nickel, tinned steel, armature banding, aluminum, brass, bronze, German silver wires and tarnac, a new manganese resistance material, have recently made extensions to their plant and installed a number of fine wire and heavy wire continuous machines, also insulating machines.

The City Foundry Company is a new business firm that

has started at Warren, Ohio. The company has secured the building formerly occupied by the DeWaldo-Taylor Co., on Williams street, opposite the former Diana house. The west portion of the building will be raised to a two-story building, and a full equipment of foundry machinery will be installed for the operation of a jobbing foundry.

The Niagara Alkali Company, Niagara Falls, N. Y., are at present putting up two new buildings which will greatly enlarge their capacity. At present they manufacture caustic potash for the cleaning of metals. The potash is put up in both the solid, liquid and broken form, the solid in cans of 100 to 600 pounds, liquid in cans of 300, 600 and 1,300 pounds and the broken in 100, 200, 500 and 1,000-pound cans.

The Western Metal Supply Company have recently moved into their new building, built especially for them, at Seventh and L streets, San Diego, Cal. This is one of the largest establishments of its kind in southern California. The combined floor space now available is equal to two and one-third acres. With these increased facilities the company is in better position than ever to supply the wants of its customers with all kinds of metals.

The John H. Robinson Foundry, Bridgeport, Conn., organized by J. H. Robinson, formerly general manager of the Fairfield Aluminum Foundry of Fairfield, Conn., is now in operation. High-grade aluminum castings in sand and metal molds are being turned out and prospects are very bright for increased business which will necessitate additional installations in the way of equipment, such as furnaces, etc.

The Balbach Smelting and Refining Company, Newark, N. J., manufacturers of the N. B. B. brand of copper ingot, now announce that they are manufacturing a special high-grade brass and composition ingot for the foundry trade. The quality of the product is guaranteed by the company and this they are enabled to do, by reason of their superior facilities in smelting and refining processes.

It is reported that the Aluminum Castings Company, of Ohio, has bought the plant of the Manitowoc Aluminum Foundry, Manitowoc, Wisconsin. The latter concern was organized about ten years ago and has grown to be an important industry. Conrad Werra, president at the time of the sale, has been appointed State representative for Wisconsin for the Aluminum Castings Company, and will have personal charge of the Manitowoc plant.

The Anthony Company, 45 West 34th street, New York, has taken over, as licensee, the manufacture and sale of the oil burners and oil burning equipment of the American Combustion Company. It will continue the development and marketing of these devices, and also that of certain important inventions of its own. The officers of the Anthony Company are Nicholas W. Anthony, president; A. Rowan Anthony, vice-president; Harry J. Lucas, secretary-treasurer, and Charles Boone, general manager.

The Greenville Metal Products Company has moved from Jamestown, N. Y., to Greenville, Pa. The company takes over the Shelby Steel Tubes Company's plant at Greenville, with twelve acres of land and three acres of steel and brick buildings. The capitalization is $600,000, and automobile parts and equipment for steel passenger coaches will be manufactured. The president of the company is Scott H. Penfield and Benjamin S. Dean is general counsel.

The Northern Engineering Works, Detroit, Mich., report recent installations of Newton cupola furnaces, which include the following: The Specialty Foundry Company, Zelienople, of 12 tons capacity per hour; two to the Ford Motor Company, Detroit, each of 9 tons capacity per hour; one to Massey Gin and Machine Company, Macon, Ga., 5 tons capacity; one to Hamden Foundry Company, of 3 tons capacity; and one to the Orrville Pump Company, of 7 tons capacity per hour.

The Seneca Brass & Plating Works, Utica, N. Y., are now doing business at the old stand of the Utica Brass Works, which has been moved to larger quarters. The Seneca company reports that business so far has been exceptionally good. The men composing the Seneca Brass Works are J. F. Lyons, F. H. Wilkins, O. F. Koelbel and Charles L. Fenner, all of whom were formerly in the employ of the Utica Brass Works. The company will manufacture gas, electric and combination fixtures and do nickel, copper and brass plating, oxidizing and repair chandeliers, lamps and all kinds of brass works.

The Lumen Bearing Company, brass founders, Buffalo and Toronto, are announcing to the trade that their patent 632,443, which covers their Lumen bronze product, has been adjudged valid as to all of its claims. In a recent decision of the United States Circuit Court for the Eastern District of New York a perpetual injunction has been granted against Isaac Shonberg, of Brooklyn, N. Y., restraining him from manufacturing, selling or using in any manner any of the patented alloys. The Lumen Bearing Company further say that they are the only manufacturers of Lumen bronze in ingots or castings.

R. F. Lang, of 31 Broadway, New York, who represents the "Royal" brand of phosphor copper, phosphor tin, manganese copper, etc., returned from his annual trip abroad and reports that the Royal works are working day and night to keep up with orders which keep pouring in from all over the world. Mr. Lang has acquired the sole agency for the United States for "Atlas Lead Cement," a substance extensively used abroad in place of lead where used in anchoring machinery, pipe connections, etc. It is said to be much cheaper than lead, twice as strong and that one pound of Atlas Lead Cement gives better results than 5½ pounds of lead.

The National Carbon Company will build at Niagara Falls, N. Y., a large plant similar to the Clarksburg, W. Va., works of the concern. At the latter point the works are devoted exclusively to the manufacture of carbon electrodes, which are now being used in large quantities for electric furnace work. Niagara Falls is a large consumer of such articles, so that for some time past the officials of the company have had their attention directed toward Niagara Falls as an advantageous center for manufacturing carbon electrodes and other carbon commodities. At the outset 200 skilled workmen will be employed at the Falls. The main building will be a furnace room 300 feet long.

"Assyrian Gold," a new and original line of gold-plated novelties that bids fair to become the most popular selling line on the market is now being produced by the Benedict Manufacturing Company. Inspired by the decorative arts of ancient Assyria, each piece possesses some characteristic and potent symbol of antique gems, such as the scarabi, in carved jade, lapus lazuli and various other stones of harmonious coloring, thus adding a touch of individuality and unusual interest to each design. Wherever shown, Assyrian gold has been generally conceded to be by far the most original and strikingly beautiful effect ever produced in any line of novelties placed on the market in years.

At Niagara Falls, N. Y., the United States Light and Heating Company, capitalized at $17,500,000, is erecting a plant that will give employment to about 2,000 men. The company will manufacture storage batteries and appliances for lighting and heating railway cars. The company, which was incorporated in 1908 now has a plant in Buffalo, known as the National Battery Company, a second in Milwaukee, known as the Bliss Car Lighting Company, and a third in New York. All three plants will be merged at Niagara Falls. W. H. Silverthorn is president of the concern. Upward of $300,000 will be spent at first on the plant, which will comprise thirteen buildings, covering about ten of the twenty acres that the company has acquired. The two main buildings will be 246 feet long, 40 feet wide and two stories high.

The Vernon Metal Company, Hudson Terminal Building, New York, announce that, as representatives of A. Auerbach, Hamburg, Germany, they are prepared to take buying or selling orders to be executed on the new Hamburg Metal Exchange, which has recently been established under the auspices of certain large

banking houses. The new exchange deals in copper and tin only. Besides the usual exchange transactions the Hamburg Metal Exchange offers the advantage that forward contracts may be closed for future deliveries, six, nine and twelve months ahead. Thus the manufacturer has an opportunity to cover his sales of manufactured goods for the whole period of the contracts he has tendered for. At present the London and New York exchanges permit only the covering of sales or purchases for a period not exceeding three months, and therefore the manufacturer is bound, when entering a contract, for the supply of goods over a period of twelve months to take chances as to the prices at a later date, and a close calculation becomes impossible. A further advantage is offered by the fixing of the minimum quantity dealt in at ten tons, and the multiple of five tons upwards. The London Metal Exchange only allows dealings in copper in quantities of twenty-five tons minimum, and the multiple of tweny-five. With the exceptions noted above, all terms of contracts are identical with those in vogue in London. The Vernon Metal company are sellers of all kinds of new metals, including copper, tin, aluminum, spelter, lead, antimonial lead, antimony.

FINANCIAL

The Pittsburg Lamp Brass and Glass Company have declared their regular quarterly dividend of 1¾ per cent. on the preferred stock.

The General Electric Company have issued their eighteenth annual report for the year ending December 31st, 1909, under date of April 15th, 1910. This report is in the form of a pamphlet addressed to the stockholders of the company, and includes the report of Vice-President J. R. Lovejoy on sales, the report of Vice-President E. J. Rice on manufacturing and engineering, and that of Henry W. Darling, treasurer, on finances. This latter report gives the following information.

The profits of the Company for the eleven months ending December 31, 1909 (including $478,019,63 from securities sold, and $1,260,847.99 from royalties, dividends, interest, etc.), after deducting all patent, general and miscellaneous expenses, fixed charges, and allowances for depreciation and losses, and writing off $2,447,984.25 from factory plants, were.....$6,493,670.88

Dividends (including dividend paid January 15, 1910	5,214,352.00
Surplus for the eleven months.....	1,279,318.88
Surplus at the end of fiscal year	16,102,062.81
Total Surplus December 31, 1909.....	$17,381,381.69

REMOVALS

The Pittsburg office of the Aluminum Company of America has been moved to 2344 Oliver Building.

The Jamestown Metal Furniture Company have removed to the ground floor, store and basement, 405 Broadway, New York (near Walker street, and Canal street subway station).

The Hannifin Manufacturing Company, 557 West Jackson Boulevard, Chicago, manufacturers of pneumatic tools for brass workers, have moved from the fourth to the fifth floor of the building, where they will have double the room and capacity that they have had heretofore. They have been having a fine business for their brass workers' chucks and pneumatic tools, and will now be able to supply the wants of their customers in much better shape than heretofore.

FIRES

The riveting, pattern and machine shops of the Hansel Elcock Company, Chicago, Ill., were totally destroyed by fire on June 16. The company report that their foundry is practically intact and that the loss incurred approximates $100,000.

The Central Brass Manufacturing Company, Cleveland, O., manufacturers of the highest grade brass goods for plumbers and water works, report in regard to the fire on June 13, that it destroyed the frame addition to the foundry and temporary quarters were immediately secured and the work of the foundry had not been interfered with. Shipments are going forward as usual. The new building will be completed within a short time.

The plant of the C. G. Conn Co., Elkhart, Ind., said to be the largest manufacturers of brass band instruments in the world, was completely destroyed by fire on May 22, and a loss of $500,000 was entailed. It is stated that the fire department could not get adequate water pressure to make any impression on the fire. A pressure of from 20 to 90 pounds was all that the local water company was able to furnish, while at least 110 pounds was necessary, according to the fire department. The company report that reconstruction is already under way and the new factory is expected to be completed in record time. The three hundred employees turned out of work by the fire will be retained by the company and put to work as soon as facilities are provided. Temporary quarters have been secured to facilitate the completion of the large number of pressing orders now on the books of the company.

BUSINESS TROUBLES

The Chandelier and Art Brass Works of Richmond, Indiana, has been placed in the hands of a receiver. The Dickinson Trust Company as receiver will conduct the plant until the supply of raw material and unfinished products now on hand is exhausted. It is probable that the receivership will end in the reorganization of the corporation. Its failure is due to inability to secure capital. The plant was incorporated July 12, 1902, as a $100,000 concern and all stock subscribed for was paid up. The output of the company has been of an unusually high standard. The art brass fixtures it has put out have been used in some of the finest buildings of the country.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Correspondence" columns.

YARDLEY BRONZE COMPANY, Boston, Mass. Capital stock, $50,000. To manufacture and sell bronze. Treasurer, E. P. Jones, Boston.

THE E. S. HUNTER PLATING COMPANY, Taunton, Mass. Capital stock, $10,000. Directors: E. S. Hunter, Florence O. Hunter, L. Swig, all of Taunton, Mass.

ALUMINUM CASTINGS COMPANY, an Ohio corporation. Capital stock, $800,000, and $50,000 interest in Wisconsin, filed a statement to do business in the State of Wisconsin.

SOUTHERN BRASS MANUFACTURING AND PLATING COMPANY, Houston, Tex. Capital stock, $12,000. Incorporators: D. C. Welling, G. C. Staiti, H. E. Godbold, all of Houston.

THE J. TONKIN COMPANY, Camden, N. J. Capital stock, $10,000. Nickel platers. Incorporators: John Keough, Robert Bastian, Jr., George H. B. Martin, all of Camden, N. J.

HARTMAN INGOT COMPANY, Chicago, Ill. Capital stock, $6,000. Dealers in scrap metal and metal ingots. Incorporators, Lee J. Frank, Charles Goodman and Adolph L. Bender, all of Chicago.

KNICKERBOCKER BRASS GOODS COMPANY, New York. Capital stock, $50,000. To manufacture and deal in brass goods. Incorporators: E. J. Forhan, J. J. Harper, G. F. Martin, New York City.

THE CUPROR COMPANY, New York. Capital stock, $5,000. To deal in copper and other metals. Incorporators: Lewis C. Smith, Theodore F. Conrad, Alfred J. Jollon, all of 50 Church street, New York.

HUDSON METAL COMPANY, New York. Capital stock, $2,000. To deal in old and new metals of all kinds. Incorporators: Abraham Hirschhorn, Hyman Schotter, Abraham Schotter, all of New York.

LUNDHAVEN BRASS FOUNDRY COMPANY, Buffalo, N. Y. Capital stock, $15,000. General foundry and manufacturing business. Incorporators: Geo. W. Morris, Frank P. Lund, J. Gordon Rappell, all of Buffalo.

WOLFF-TRAUTZ COMPANY, Newark, N. J. Capital stock, $50,000. To refine gold, silver and all other metals. Incorporators: John B. Wolff, Chas. C. Trautz, Sr.; August L. Trautz, all of Newark.

J. D. CROSBY COMPANY, New York. Capital stock, $20,000. To manufacture and deal in steel, iron and brass products. Incorporators: Gordon Gordon, Edwin Benson, and Morris Bloch, all of New York.

CHICAGO-RACINE ALUMINUM, BRASS AND IRON WORKS, Chicago, Ill. Capital stock, $16,000. To manufacture metal specialties. Incorporators, Elmer E. Jackson, Clyde C. Colwell, Cyrus H. Adams, Jr., all of Chicago.

PREMIER METAL ETCHING COMPANY, New York. Capital stock, $26,000. To manufacture and deal in metal goods, novelties, ornaments. Incorporators: August Rotlach, Adolph Lehrfeld, Edward Rogge, all of New York.

THE KRAUSS CHANDELIER WORKS COMPANY, Newark, N. J. Capital stock, $25,000. To manufacture electric fixtures, brackets, chandeliers, etc. Incorporators: Clarence V. D. Smith, Herman Thevenet, Alwin Krauss, all of Newark.

JOHN PALACHEK BRONZE AND IRON COMPANY, Brooklyn. Capital stock, $10,000. To deal in all kinds of bronze, iron and metal work. Directors: John Palachek, of Elmhurst, and Louis Schmitt and George Schmitt, of New York City.

NEW PRODUCT COMPANY OF HARTFORD, Hartford, Conn. Capital stock, $25,000. To manufacture and deal in metals, oils, hardware, etc. Incorporators: Christopher J. Roach, Roswell W. Newton, Clinton H. Newton, all of Hartford.

DETROIT ALUMINUM SOLDER COMPANY, 61 Fort street, East, Detroit, Mich. Capital, $2,000. To manufacture an aluminum solder. The officers are: Herman B. Strate, president; J. M. Trudell, vice-president; J. J. Jerome, secretary and treasurer.

HICKS-JOHNSON COMPANY, INC., West Hoboken, N. J. Capital stock, $100,000. To engage as toolmakers, brass founders, metal workers, and builders. Incorporators: George C. Hudson, Adolph C. Carston and Francis H. McCadley, West Hoboken.

PRAHAR & SCHWARZ MANUFACTURING COMPANY, New York. Capital stock, $5,000. To manufacture metal novelties. Incorporators: Leopold H. Prahar, Frances Prahar, both of 619 West 143d street; Frederick Schwarz, 522 West 145th street, New York.

LATTY MANUFACTURING COMPANY, Ellicottville, N. Y. Capital stock, $15,000. To make and sell goods manufactured from metal and wood. Directors: G. Frank Latty, W. D. Walrath, Frank Fitzpatrick, Charles A. Case, A. E. Ames, L. B. Nichols, B. B. Smith, all of Ellicottville.

THE EUROPEAN ART BRASS GOODS MANUFACTURING COMPANY, New York. Capital stock, $10,000. To manufacture and deal in art brass and copper ware. Incorporators: Judah Bellitz, 230 Madison avenue; Israel Tuttman, 75 Allen street; Bernard Klein, 710 East 60th street, all of New York City.

VICOSE WHITE BRASS COMPANY, New York. Capital stock, $1,000. To manufacture and deal in bearing metals, brass and brass castings. Incorporators, Charles Trosk, 1631 Eighth avenue, Brooklyn; Ely Simpson, 1831 Seventh avenue, New York City; John Mithertz, 7 Rivington street, New York City.

CRESCENT BRASS MANUFACTURING COMPANY, Cleveland, Ohio. Capital stock, $10,000. To engage in metal spinning and the manufacture of artistic brass products. Incorporators: Charles H. Hofrichter, William J. Luck, E. G. Strub, John W. Bowles, William E. Patterson, all of Cleveland. The company will take over the business of L. A. Weber & Company. C. H. Hofrichter will be the manager.

INCREASE OF CAPITAL STOCK

The Burlington Brass Company, Burlington, Wisconsin, have increased their capital stock from $70,000 to $200,000. This large increase in capital was found necessary to conform with the growth of the business of the concern.

ELECTIONS

The stockholders of the Newport Sand Bank Company held a meeting on June 27, and elected Cleveland H. Dye a director in the place of J. Frank Dye, deceased. The directors held a meeting and elected the following officers: Geo. W. Dye, president and treasurer, in place of J. Frank Dye, deceased, and Cleveland H. Dye as secretary.

PRINTED MATTER

TOOL AND DIE GRINDER No. 1. is described in bulletin 107 by the Baird Machine Company, Oakville, Conn. This grinder is a new product for this concern and is claimed to be a very useful machine for any metal working shop.

MOLDING MACHINES.—The Adams Company, Dubuque, Ia., describe their extensive line of Farwell squeezers and pneumatic rappers, together with aluminum match plates and patterns in circular No. 105. The circular gives full instructions for making molds by the use of these machines, and will be sent upon request.

BABBITT.—A small folder has been issued by the Empire Metal Company, Syracuse, N. Y., describing the merits of the metals made by this company. These products include a number of varieties of babbitt bearing metals, which are manufactured and guaranteed to rigid specifications, and are guaranteed to prove satisfatcory for any purpose to which a bearing metal may be put.

REFRACTORY MATERIAL.—The Detroit Foundry Supply Company, Detroit, Mich., has issued a twenty-five-page catalogue descriptive of their fire brick and refractory material. The catalogue gives considerable information regarding the numerous varieties of fire brick for all purposes carried in stock by this company. Further information may be obtained by inquiring for Catalogue No. 2.

FURNACES, FUEL OIL AND GAS BURNING APPLIANCES, a 32-page catalogue, has been issued by the W. S. Rockwell Company, 50 Church street, N. Y., which gives pictures of the Rockwell fuel oil burners and their applications. The catalogue contains also a series of tables giving the capacity of various sizes of fuel oil tank. There is an insert sketch showing the distribution of a fuel oil burning system.

PARTING COMPOUNDS.—The Keystone Foundry Supply Company a new foundry supply house of Buffalo, N. Y., has issued a blotter describing the merits of their Niagara parting compound. This material is sold subject to approval and is claimed to be much better than charcoal, as it gives perfect lifts and eliminates the necessitty of parching molds. A working sample and quotations will be sent upon request.

CASKEY UNIVERSAL COUPLINGS AND VALVES FOR COMPRESSED AIR. The Caskey Valve Company, 99 John street, New York, issue a six-page folder in which they describe their swivel joint pneumatic hose couplings and compressed air valve which are claimed to be tight under all pressures. These articles are made

of manganese bronze in all sizes, from ¼ to 1¼ inches for the couplings and from ¼ to 3 inches for the valves. Samples will be sent free of charge.

FOUNDRY MACHINERY.—A small booklet has been issued by the Northern Engineering Works, Detroit, Michigan, describing their improved and thoroughly modern Newton cupola, foundry elevators, electric portable hoists, pendant winch hand-power traveling cranes, electric traveling cranes, as well as air hoists and air hoist cranes, industrial railways, trucks and turntables, switches, tumbling barrels and overhead tracks and trolley switches and hoists. The pamphlet will be sent upon application by referring to No. 93.

PATTERN MAKERS SUPPLIES AND FOUNDRY CHAPLETS. The Cleveland Fillet Company, 1444 East 49th street, N. E., Cleveland, Ohio, tell in a 34-page catalogue all about their wood and leather fillets, brass and iron dowel pins, Standard white pine diamond pattern lumber, and improved pattern letters and figures, which are made of white metal from entirely new stock, the mixture varying somewhat according to the size of the letter. These letters are made in various styles of type, such as sharp, flat and round-face gothic.

PRESSES.—The cylinder turret drill press is the subject of a folder sent out by the National Separator and Machine Company, Boston, Mass. This press is intended for irregular and duplicate work requiring more than one operation and one center, such as drilling different sized holes, reaming, counterboring, tapping, and all chuck and jig work in the same alignment, without stopping the machine until all operations are completed. The machine is built in a number of sizes and styles, and prices will be quoted upon application.

FLUXES.—The Allyne Brass Foundry Company, Homogen Department, Cleveland, Ohio, have issued an attractive folder describing the merits of their well-known foundry flux Homogen (the metal scavenger). This folder gives a number of very flattering testimonials from firms who have used this material and have found it everything that has been claimed for it. The Allyne Company make a very fair and impartial trial in regard to Homogen, by means of which anyone can make a test, and if the required results are not obtained, no expense is incurred.

SAFETY VALVES.—A new idea in catalogues is the series of loose leaf pages enclosed in a flexible cover just issued by the Crosby Steam Gage and Valve Company, in the interests of the Johnstone & Crosby valves. These valves are made in a variety of styles, as Johnstone blow-off, Crosby water relief, underwriter water relief, yacht pop safety valve, standard pop safety, inspector pop safety valves. These valves are made of gun metal and iron, and are tested to the highest efficiency, and are guaranteed for all classes of industrial service up to a reasonable limit.

FURNACES.—A new tilting crucible melting furnace is described in a bulletin just issued by the Rockwell Furnace Company, 26 Cortlandt street, New York. This furnace is intended for use in melting aluminum, brass, copper, cobalt, gold, manganese, silver, etc., and is equipped with a burner which is operated with an air blast of only 12 ounces, thereby making but very little noise. The furnace is made in four sizes, ranging from a working capacity of two hundred to eleven hundred pounds. Full information may be obtained regarding these furnaces by inquiring for bulletin M.

METALS.—The J. Arthur Limerick Company, Howard street and Park avenue, Baltimore, Md., have issued a return postal card giving information relating to the extensive line of metal goods manufactured by them. This company makes a specialty of making castings requiring exceptional workmanship and finish. They are prepared to furnish castings of any size for any duty, machinery, marine, electric, steam, water, oil, air or automobile; also architectural, artistic and ecclesiastical bronzes, brasses, letters, numbers and figures, etc. They also do gold, silver and nickel plating, ormolu finishing, oxidizing, polishing, and metal coloring.

RECORDING INSTRUMENTS.—Bulletins Nos. 124 and 125 have been issued by the Bristol Company, of Waterbury, Conn. This company describes in these bulletins Bristol's recording thermometers for outdoor atmospheric temperatures, Bristol's portable round form class 1 recording thermometers with eight-inch charts, and Bristol's six-inch class 1 recording thermometer. The design of the last mentioned instrument was patented in 1899, but this particular form is now being brought out for the first time and is specially suitable for chilled room temperatures in cold storage plants, greenhouse temperatures, drying rooms for leather, crucibles, etc. Copies of these bulletins can be obtained upon request.

SKIMMING TANKS.—A patented process for skimming metal dross is described in a ten-page folder issued by the Metal Dross Economy Company, Bristol, Conn. This process consists in skimming the dross from the top of a pot of melted metal into a tank containing water, set in the floor of the casting shop. In carrying out the details of the process the company utilizes a neat and self-contained three drawer screen cabinet, which is called the metal dross separator. After the material has been collected in the tank at the close of the day's work this is passed through the various screens in the separator and thus all the metal, which the dross contained, is very rapidly recovered in a suitable form for remelting.

METALLIC PACKING.—A booklet has been issued by the New Era Manufacturing Company, Kalamazoo, Mich., descriptive of the New Era metallic packing or self-lubricating bearing material. This company say that they have thoroughly demonstrated the practical value of this improved product by practical tests extending over a period of several years, and they now offer it for sale with full knowledge of its superior qualities. This product consists of a high grade of anti-friction alloy reduced to a sponge-like form, in which the metal portions are highly attenuated, and of irregular and interrupted surface formation, treated with lubricating oils and then coated, on all its surfaces throughout the sponge-like mass, with flaked and comminuted friable mineral lubricating substances, which converts the whole mixture into a compound mass of metallic lubricants. Additional information, together with prices and materials for testing, can be obtained by writing to the above company.

CATALOGUE EXHIBIT

An exhibition of every kind of catalogue may be seen at THE METAL INDUSTRY office, 99 John street, New York. THE METAL INDUSTRY is prepared to do all of the work necessary for the making of catalogues, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

AD NEWS

In this issue the Hawley Down Draft Furnace Company, of Chicago, Ill., bring to the attention of the metal trade their new oil-burning crucible furnace.

The Osborn Manufacturing Company, Cleveland, Ohio, have a striking page advertisement describing their new direct-draw roll-over molding machine.

The Detroit Foundry Supply Company, Detroit, Mich., feature their platers' supply department in this month's advertisement, calling attention particularly to their buffing wheels, Standard White Finish, Stevens' Polishers' Friend, and Black Tripoli.

COPPER PRODUCTION

(Issued by the Copper Producers' Association.)

	July 8, 1910. Pounds.
Stocks of marketable copper of all kinds on hand at all points in the United States, June 1, 1910.....	160,425,973
Production of marketable copper in the United States from all domestic and foreign sources during June, 1910	127,219,188
	287,645,161
Deliveries:	
For domestic consumption 53,363,196	
For export 65,895,948	
	119,259,144
Stock of marketable copper of all kinds on hand at all points in the United States, July 1, 1910....	168,386,017
Stocks increased during the month of June.....	7,960,044

METAL MARKET REVIEW

NEW YORK, July 8, 1910.

COPPER.—Standard copper in London shows a net decline for the month of £2 7s. 6d. per ton. The trading has not been very active. Tired holders have gradually let go their holdings, and in face of the increased supplies in America there has been no new buying interest in the market.

In the New York market business has been very slow, and prices have sagged off about ¼ cent per pound. While the Calumet & Hecla Company reduced their price abroad and were able to book a good tonnage it is noted that the leading selling agents in this market have not reduced their price, and nearly all the business that has been put through has been by the interests outside of the United Metals Selling Company.

The Amalgamated interests have decided to restrict their mining operations in the Butte district to five days a week; the mines are turning out more metal than the smelters can handle. There is no sign of any restriction by any of the other companies, and this small reduction in output by the Butte properties has had no effect on the market. There are rumors around that the leading selling agents are trying to get Europe to take over the 100,000,000 pounds surplus stock this concern is now carrying. Money is cheaper on the other side, but beyond that fact the deal would not be of much benefit to this market; the copper would still be a menace to the market whether it is carried here or abroad.

The exports for the month were 22,688 tons, total exports since January, 1910, 128,482 tons, against 147,480 tons same period in 1909. Prices today are about the same as a month ago, Lake, 12.75; Electrolytic, 12.50; Casting brands, 12.40.

TIN.—The London tin market has fluctuated during the month within a range of about £2 per ton, closing at the end of June just £1 higher for the month.

In New York, prices show an advance of about ⅜ cent per pound.

Statistically, the market is in good shape. The total visible supply for the month is about 3,000 tons less than a month ago. The deliveries into consumption according to the Metal Exchange returns were 5,000 tons. This is not taken seriously by the trade; it simply means that this stock was moved from public warehouse in New York to interior points. No one was fooled by this very apparent manipulation and the effect on the market has been nil.

Prices today are about ⅜ cent per pound above the price a month ago, 5-10 ton lots spot, 32.85 cents; futures, about the same figure.

LEAD.—The foreign lead market stays around £12 10s. te £12 15s. and closed at £12 11s. 3d.

In the New York market prices have ruled very steady at around 4.40 to 4.45 New York, and in East St. Louis from 4.15 to 4.27½, closed at 4.25.

SPELTER.—The foreign spelter market stays pegged at around £22 5s. to £22 7s. 6d.

In the New York market the spelter market has been a shade easier and prices are from 5 to 10 points lower. In New York the spot price of spelter has been held firm, but future shipments from the West can be shaded. Price today for prompt shipment from the West, 5.15 to 5.20; in East St. Louis, 4.95 to 5 cents.

ALUMINUM.—The market for aluminum has been easier on free offers by importers, and for round lots today the market is quotable at 22¼ to 22¾ for 98-99% pure. Smaller lots are held at 23½ to 24 cents.

ANTIMONY.—In the foreign market Halletts is down to £29 and other brands £28 10s.

In the New York market prices are about ⅛ cent per pound lower. Cookson's, 8¼; Hallett's, 8 cents; Hungarian grade 7.30, with Chinese offered at 7⅜ cents.

SILVER.—The silver market has been very dull at around 24 5/16d. in London, and 53½ cents in New York.

QUICKSILVER.—The foreign market is steady at £8 15s. to £8 12s. 6d. In New York the market is dull at $47 per flask, wholesale, to $48 to $48.50 for jobbing lots.

PLATINUM.—The market is firm at $36 per ounce for hard, and $34 for ordinary. Scrap is worth about $29 to $29.50 per ounce.

SHEET METAL.—There has been no change in sheet brass or copper. Copper wire is lower at 14 cents base. Sheet copper, 18 cents; seamless brass tubing, 18 cents; copper tubing, 22 cents; and sheet brass at 14 cents.

OLD METALS.—The old metal market is dull and uninteresting. Prices are about the same as a month ago, but trading is very listless, and what little business is put through has to be done at a very close margin.—J. J. A.

THE JUNE MOVEMENTS IN METALS

COPPER.	Highest.	Lowest.	Average.
Lake	13.00	12.60	12.75
Electrolytic	12.85	12.35	12.65
Casting	12.75	12.35	12.50
TIN	33.25	32.60	32.85
LEAD	4.45	4.40	4.45
SPELTER	5.40	5.35	5.40
ANTIMONY (Hallett's)	8.10	8.00	8.05
SILVER	.53¾	.53¼	53.00

WATERBURY AVERAGE

The average price of lake copper per pound as determined monthly at Waterbury, Conn.

1909.—Average for year, 13,416. 1910.—Jan. 13⅞. Feb. 13⅞. March 13¾. April 13¼. May 13. June 12.75.

INFORMATION BUREAU

Any firm intending to buy metals, machinery or supplies and desiring the names of the various manufacturers and sellers of these products can obtain the desired information by writing to THE METAL INDUSTRY. Commercial questions are answered by return mail. Our Information Bureau is for the purpose of answering questions of all kinds. Address THE METAL INDUSTRY, 99 John street, New York.

INQUIRIES AND OPPORTUNITIES

Under our directory of "Trade Wants" (published each month in the back advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds. See Want Ad pages.

DAILY METAL PRICES

We have made arrangements with the New York Metal Exchange by which we can furnish our readers with the Official Daily Metal Market Report of the Exchange and a year's subscription to THE METAL INDUSTRY. for the sum of $10. The price of the report alone is $10. Sample copies furnished for the asking. We can furnish daily telegraphic reports of metal prices. Address THE METAL INDUSTRY, 99 John street, New York.

Metal Prices, July 11, 1910

NEW METALS.

	Price per lb. Cents.
COPPER—PIG, BAR AND INGOT AND OLD COPPER. Duty Free, Manufactured 2½c. per lb.	
Lake, carload lots	12.75
Electrolytic, carload lots	12.50
Casting, carload lots	12.40
TIN—Duty Free.	
Straits of Malacca, carload lots	32.65
LEAD—Duty Pigs, Bars and Old, 2½c. per lb.; pipe and sheets, 2⅜c. per lb.	
Pig lead, carload lots	4.40
SPELTER—Duty 1⅜c. per lb. Sheets, 1⅝c. per lb.	
Western carload lots	5.15
ALUMINUM—Duty Crude, 7c. per lb. Plates, sheets, bars and rods, 11c. per lb.	
Small lots	28.00
100 lbs. lots	25.00
Ton lots	22.50
ANTIMONY—Duty 1½c. per lb.	
Cookson's, cask lots, nominal	8.15
Hallett's, cask lots	8.00
Other cask lots	7.25
NICKEL—Duty Ingot, 6c. per lb. Sheet, strips and wire 35% ad valorem.	
Shot, Plaquettes, Ingots, Blocks, according to quantity	.45 to .60
MANGANESE METAL—Duty 20%	.80
MAGNESIUM METAL—Duty 3 cents per pound and 25% ad valorem	$1.60
BISMUTH—Duty free	2.00
CADMIUM—Duty free	.75
	Price per oz.
GOLD—Duty free	$20.67
SILVER—Duty free	.53½
PLATINUM—Duty free	33.25
QUICKSILVER—Duty 7c. per lb. Price per pound	.65c. to 67c.

OLD METALS.

Dealers' Buying Prices. Cents per lb.		Dealers' Selling Prices. Cents per lb.
11.00 to 11.25	Heavy Cut Copper	12.25 to 12.50
10.50 to 10.75	Copper Wire	11.50 to 11.75
9.50 to 9.75	Light Copper	10.50 to 10.75
10.00 to 10.25	Heavy Mach. Comp.	11.00 to 11.25
7.50 to 7.75	Heavy Brass	8.50 to 8.75
5.50 to 5.75	Light Brass	6.50 to 6.75
7.00 to 7.25	No. 1 Yellow Brass Turnings	8.00 to 8.25
8.25 to 9.00	No. 1 Comp. Turnings	9.75 to 10.00
3.90 to 4.00	Heavy Lead	—— to 4.25
3.75 to 3.90	Zinc Scrap	—— to 4.25
5.00 to 5.50	Scrap Aluminum, turnings	5.00 to 5.50
10.00 to 12.00	Scrap Aluminum, cast, alloyed	11.00 to 13.00
14.00 to 15.00	Scrap Aluminum, sheet (new)	16.00 to 18.00
19.50 to 20.00	No. 1 Pewter	23.00 to 24.00
25.00 to 27.00	Old Nickel	28.00 to 30.00

INGOT METALS.

	Price per lb. Cents.
Silicon Copper, 10% to 20% ....according to quantity	28 to 35
Silicon Copper, 30% guaranteed. " "	38
Phosphor Copper, 5% " "	19 to 21
Phosphor Copper 10% to 15%, guaranteed " "	28 to 30
Manganese Copper, 30% " "	30 to 35
Phosphor Tin " "	34 to 36
Brass Ingot, Yellow " "	9 to 10
Brass Ingot, Red " "	11 to 12½
Bronze Ingot " "	10 to 11
Manganese Bronze " "	17 to 19
Phosphor Bronze " "	13 to 16
Casting Aluminum Alloys " "	29 to 35

PHOSPHORUS—Duty 18c. per lb.
According to quantity ..... 30 to 35

PRICES OF SHEET COPPER.

BASE PRICE, 18 Cents per Lb. Net.

PRICES MENTIONED BELOW ARE FOR QUANTITIES OF 100 LBS. AND OVER.

SIZE OF SHEETS.		64 oz. and over 60 lb. sheet 30 x 60 and heavier.	32 oz. to 64 oz. 25 to 50 lbs. sheet 30 x 60.	24 oz. to 32 oz. 18¾ to 25 lb. sheet 30 x 60.	16 oz. to 24 oz. 12½ to 18¾ lb. sheet 30 x 60.	14 oz. and 15 oz. 11 to 12½ lb. sheet 30 x 60.	12 oz. and 13 oz. 9½ to 11 lb. sheet 30 x 60.	10 oz. and 11 oz. 7⅝ to 9⅜ lb. sheet 30 x 60.	8 oz. and 9 oz. 6¼ to 7⅝ lb. sheet 30 x 60.	Lighter than 8 oz.
		Cents Per Pound Over Base Price for Soft Copper.								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	1	2	3	6	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	3	6	9	
	Longer than 96 inches.	"	"	"	"	2	6			
Wider than 30 ins. but not wider than 36 inches.	Not longer than 72 inches.	"	"	"	"	2	4	7	10	
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	2	6	9		
	Longer than 96 inches. Not longer than 120 inches.	"	"	"	1	3				
	Longer than 120 inches.	"	"	1	2					
Wider than 36 ins. but not wider than 48 inches.	Not longer than 72 inches.	"	"	1	2	4	7	10		
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	5	8			
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	8				
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins. but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	6	11			
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	9				
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Longer than 120 inches.	3	5	9						
Wider than 108 ins.	Not longer than 132 inches.	4	6							
	Longer than 132 inches.	5	8							

The longest dimension in any sheet shall be considered as its length.

CIRCLES, SEGMENTS AND PATTERN SHEETS, advance over prices of Sheet Copper required to cut them from. 3 cents per pound.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot, and heavier, add ..... 1 " " "

COLD OR HARD ROLLED COPPER, lighter than 14 oz., per square foot, add ..... 2 " " "

POLISHED COPPER, 20 INCHES WIDE and under, advance over price for Cold Rolled Copper of corresponding dimensions and thickness ..... 1 " " sq. ft.

POLISHED COPPER, WIDER THAN 20 INCHES, advance over price for Cold Rolled Copper of corresponding dimensions and thickness ..... 2 " " " "

COLD ROLLED COPPER, PREPARED SUITABLE FOR POLISHING, same as Polished Copper of corresponding dimensions and thickness.

COLD ROLLED AND ANNEALED COPPER SHEETS OR CIRCLES, same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness.

ROUND COPPER ROD, ⅜ inch diameter or over ..... Base Price.
(Rectangular, Square and Irregular Shapes, Copper Rod, Special Prices.)

	Cents per lb.
ZINC—Duty, sheet, 1¼c. per lb.	
Carload lots, standard sizes and gauges, at mill	7.50 less 8%
Casks	8.00
Open casks	8.50

Metal Prices, July 11, 1910

PRICES ON BRASS MATERIAL—MILL SHIPMENTS.

In effect June 27, 1910, and until further notice.

To customers who purchase less than 40,000 lbs. per year and over 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.13¼	$0.14⅜	$0.16¾
Wire	.13¼	.15½	.17
Rod	.13¼	.15½	.18
Brazed tubing	.18⅜	——	.20½
Open seam tubing	.16⅞	——	.18½
Angles and channels, plain	.16⅞	——	.18½

50% discount from all extras as shown in American Brass Manufacturers' Price List No. 7.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring drawing and spinning brass...	½c.	per lb. net advance
" —Best spring, drawing and spinning brass....	1½c.	" " " "
Wire —Extra spring and brazing wire.....	½c.	" " " "
" —Best spring and brazing wire.....	1c.	" " " "

To customers who purchase less than 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.14¼	$0.15⅜	$0.17¾
Wire	.14½	.16½	.18
Rod	.14¼	.16½	.19
Brazed tubing	.19⅜	——	.21½
Open seam tubing	.17⅝	——	.19½
Angles and channels, plain	.17⅝	——	.19½

5% discount from all extras as shown in American Brass Manufacturers' Price List No. 7.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring, drawing and spinning brass...	½c.	per lb. net advance
" —Best spring, drawing and spinning brass....	1½c.	" " " "
Wire —Extra spring and brazing wire.....	½c.	" " " "
" —Best spring and brazing wire.....	1c.	" " " "

BARE COPPER WIRE—CARLOAD LOTS.

14c. per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	18½c. per lb. base.
100 lbs. to 300 lbs. in one order	19c. " " "
Less than 100 lbs. in one order	20½c. " " "

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ to 3½ in O. D. Nos. 4 to 13 Stubs' Gauge, 18c. per lb.
Seamless Copper Tubing, 22c. per lb.

For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron Pipe Size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb.	26	25	20	19	18	18	18	18	18	18	18	19	20	22	24	25

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet Brass.	Bronze.
⅜ inch	$8	$9
½ inch	8	9
⅝ inch	10	11
¾ inch	12	13
⅞ inch	14	15
1 inch	18	20
1⅛ inch	22	24
1¼ inch	25	27
1⅜ inch	32	35
1¾ inch	45	48
2 inch	56	60

Discount 55 and 5%.

PRICES FOR MUNTZ'S METAL AND TOBIN BRONZE.

Muntz's or Yellow Metal Sheathing (14" x 48")	14½c.	net base
" " " Rectangular sheets other than Sheathing	16½c.	" "
" " " Rod	14½c.	" "
Tobin Bronze Rod	16c.	" "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bars in the rough, 22½c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturers.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Not over 18 in. in width, not thinner than 23 B. S. Gauge, 2c. above price of pig tin in same quantity.

Not over 35 in. in width, not thinner than 22 B. S. Gauge, 3c. above price of pig tin.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

	Wider than.....	3in.	6in.	14in.	16in.	18in.	20in.	24in.	30in.	36in.
	and including.....	12in.	14in.	16in.	18in.	20in.	24in.	30in.	36in.	40in.
		in coils.								
No. 13 and heavier		34	34	36	36	36	36	39	39	39
" 14		34	34	36	36	36	36	39	39	39
" 15		34	34	36	36	36	36	39	39	39
" 16		34	34	36	36	36	36	39	39	39
" 17		34	34	36	36	36	36	39	39	39
" 18		34	34	36	36	36	36	39	39	42
" 19		34	34	36	36	36	36	39	40	43
" 20		34	36	36	36	36	38	41	42	44
" 21		34	38	38	38	38	40	43	44	50
" 22		34	38	38	38	40	40	43	47	51
" 23		34	38	38	38	40	40	43	49	52
" 24		34	38	40	42	42	42	45	51	54
" 25		36	39	41	43	43	43	46	53	57
" 26		36	39	42	46	46	46	51	55	61
" 27		36	40	44	48	48	49	54	58	64
" 28		36	40	46	48	49	49	56	62	67
" 29		38	41	48	50	52	52	61	67	72
" 30		38	42	50	52	56	62	69	72	77
" 31		43	47	55	58	63	71	74	77	83
" 32		45	49	57	61	69	77	91	90	95
" 33		47	51	60	65	73	84	91	100	110
" 34		50	55	62	70	78	91	103	110	120
" 35		..	65	70	80	90	100	115	125	..
" 36		..	80	90	100	115	120	135	..	..
" 37		..	104	114	129	144	159	174	..	..
" 38		..	124	139	154	169	184	204	..	..
" 39		..	144	164	184	204	224	..	..	..
" 40		..	174	204	224	244	..	..	..	..

In flat rolled sheets the above prices refer to lengths between 2 and 3 feet. Prices furnished by the manufacturers for wider and narrower sheet. All columns except the first refer to flat rolled sheet. Prices are 100 lbs. or more at one time. Less quantities 5c. lb. extra. Charges made for boxing.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.

Outside Diameters. BASE PRICE, 25 Cents per Pound.

Stubs' Gauge.	Inches.	¼ in.	5-16 in.	⅜ in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1¾ in.	2 ins.	2½ ins.	3 ins.	3½ ins.	4 ins.	4½ ins.
11.	.120.	..	..	..	..	..	..	..	27	24	..	..	14	20	10	9	16	23
12.	.109.	..	..	..	..	..	..	..	26	..	..	..	15	..	..	..	..	..
14.	.083.	..	..	..	..	..	..	..	..	..	..	..	17	..	..	..	..	..
16.	.065.	..	..	..	..	..	28	27	27	24	23	21	21	21	21	27	31	57
18.	.049.	..	..	..	..	33	30	29	28	25	26	26	26	..	..	..	..	..
20.	.035.	117	..	46	39	34	33	32	30	29	30	30	30	31	38	49	58	81
21.	.032.	..	..	..	40	..	..	..	..	..	..	..	..	..	..	..	..	..
22.	.028.	138	98	48	42	38	37	35	34	..	..	45	..	..	..	..	..	..
24.	.022.	188	133	108	88	79	73	62	60	63	..	..	..	..	..	..	..	..

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

Diameter. B. & S. Gge.	000 to No. 10.	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price, per lb....	32	32½	32½	33	33½	34	34½	35	36	37	38	43	46

200 lbs. to 30,000 lbs., 3 cents off list; 30,000 lbs. and over, 4 cents off list.

PRICE LIST FOR GERMAN SILVER IN SHEETS AND ROLLS.

Per cent.	Price per lb.	Per cent.	Price per lb.
12	$0.52	16	$0.58
13	.53	17	.59
14	.54	18	.60
15	.55		

These prices are for sheets and rolls over 2 inches in width, to and including 8 inches in width and to No. 20, inclusive. American or Brown & Sharpe's Gauge. Prices are for 100 lbs. or more of one size and gauge in one order. Discount 30%.

GERMAN SILVER TUBING.

4	per cent.	to No.	19, B. & S. Gauge, inclusive	$0.60
6	"	"	19, " " "	.70
9	"	"	19, " " "	.85
12	"	"	19, " " "	1.00
15	"	"	19, " " "	1.15
16	"	"	19, " " "	1.20
18	"	"	19, " " "	1.30

German Silver Tubing thinner than No. 19 B. & S. Gauge add same advances as for Brazed Brass Tube.

For cutting to special lengths add same advances as for Brazed Brass Tube. Discount 40%.

PRICE OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 2c. below to 6c. above the price of bullion.

Rolled silver anodes .999 fine are quoted at 2c. to 3½c. above the price of bullion.

ALUMINUM COMPANY OF AMERICA

PITTSBURGH, PA.

ALUMINUM

SHEET TUBING
EXTRUDED SHAPES
ROD RIVETS WIRE
ELECTRICAL CONDUCTORS

Branch Offices

NEW YORK—99 John St.
BOSTON—131 State St.
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OLD METALS GENERALLY

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For Advertisement of

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See Page 53

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ALUMINUM CASTINGS

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This does not cover the entire line but it will do for an index.

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